Fig. 1

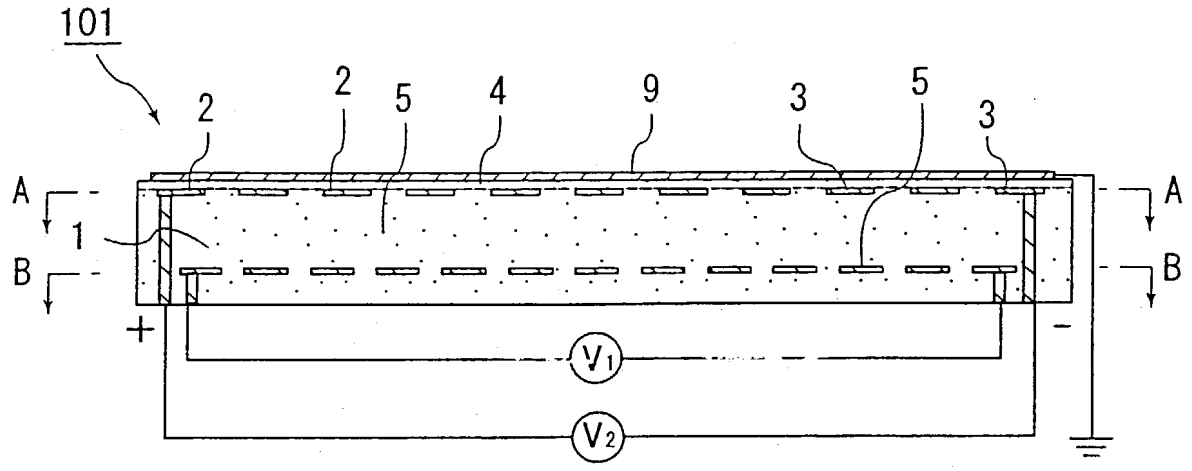


Fig. 2

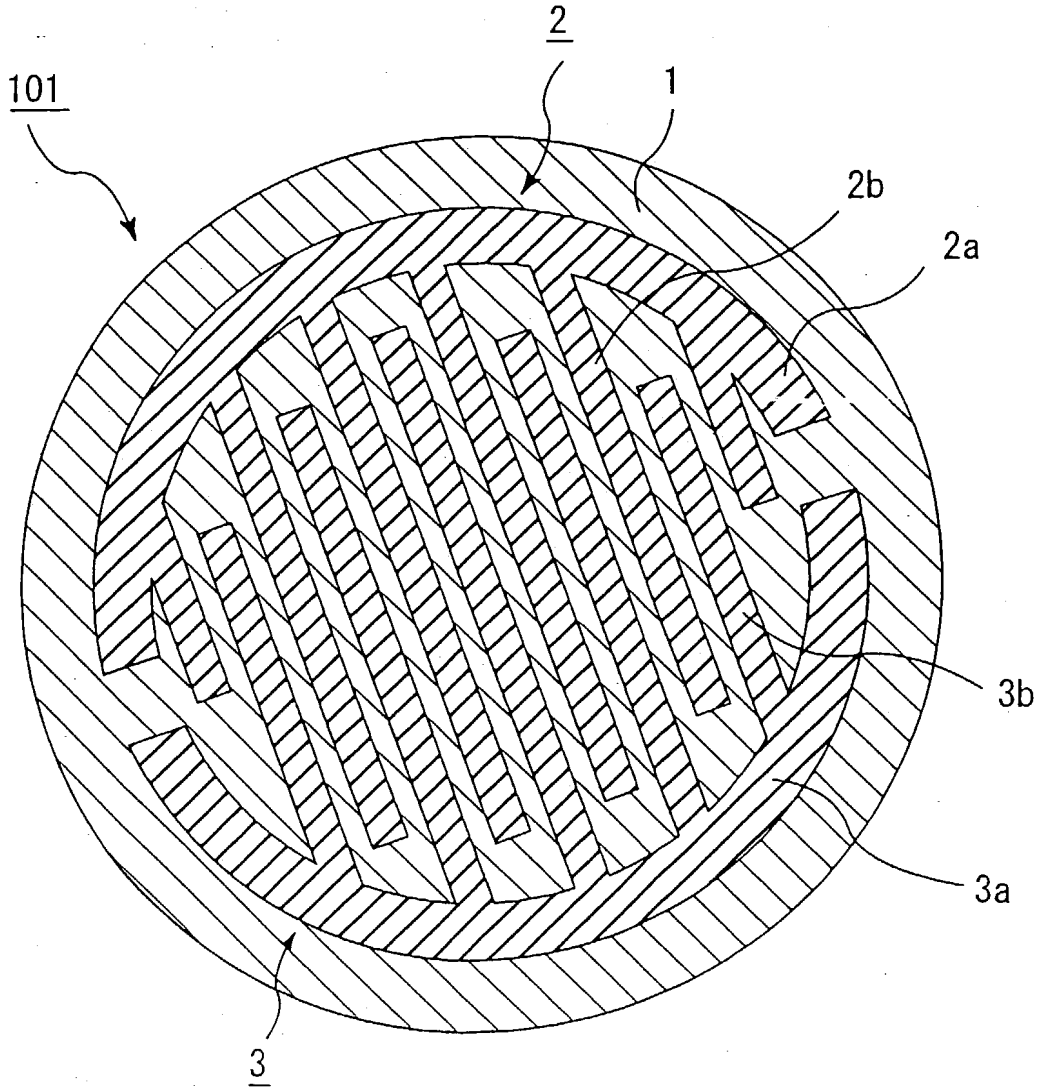


Fig. 3

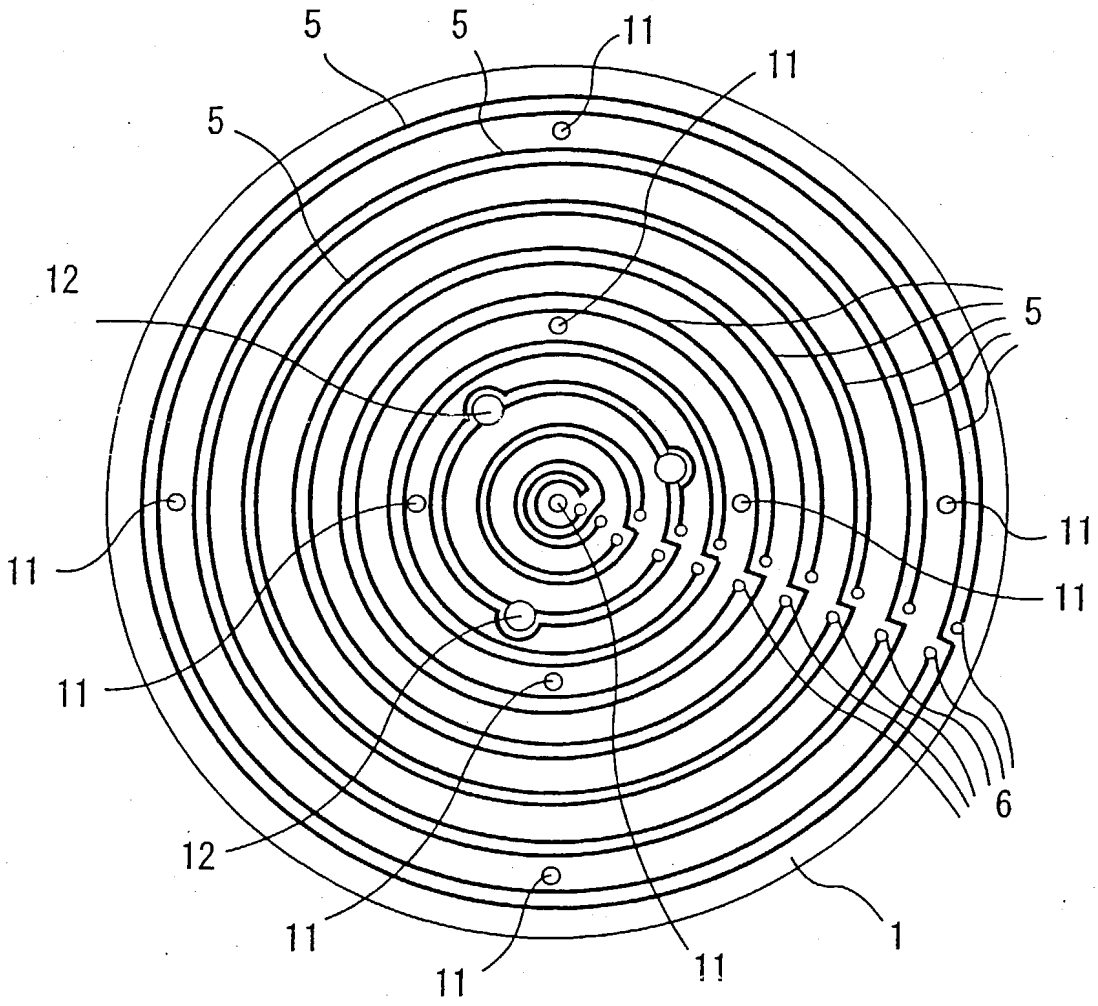


Fig. 4

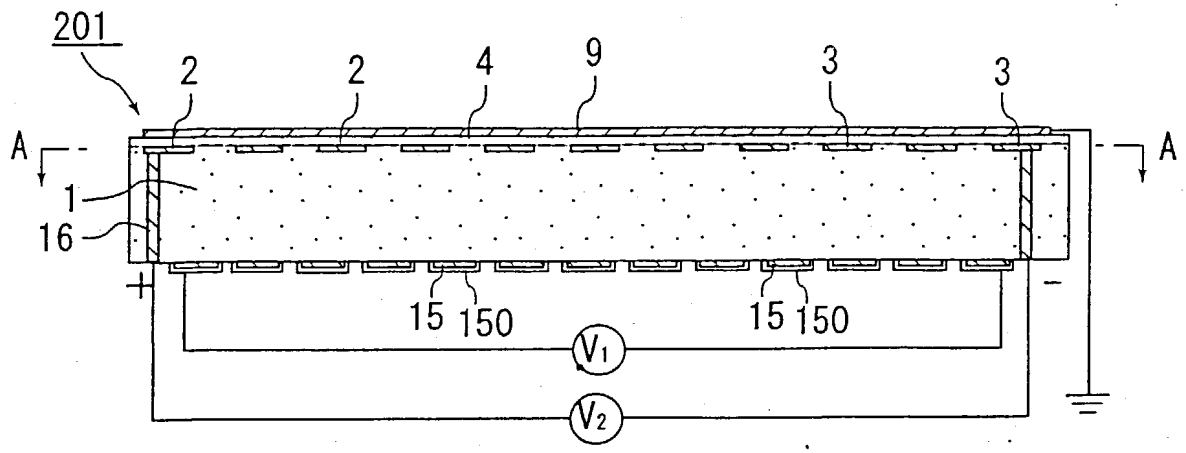


Fig. 5

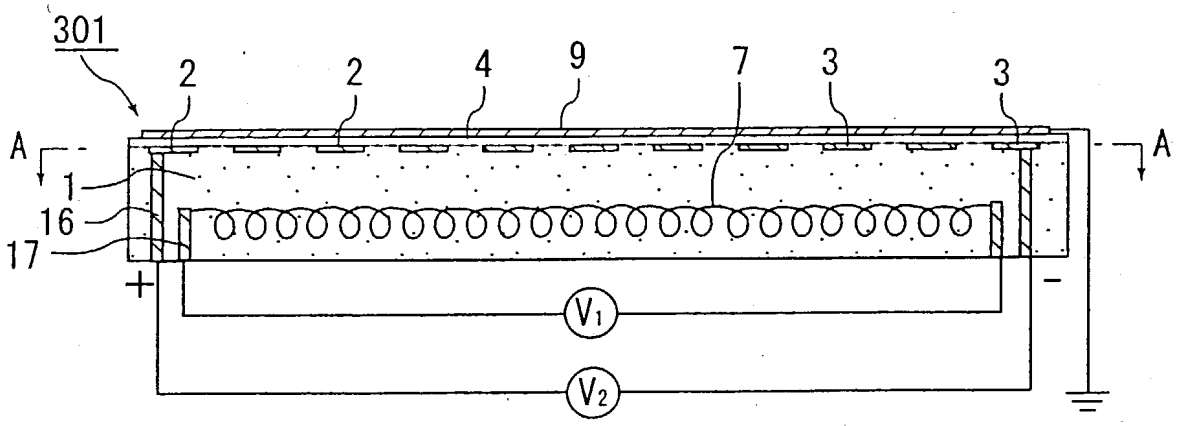


Fig. 6

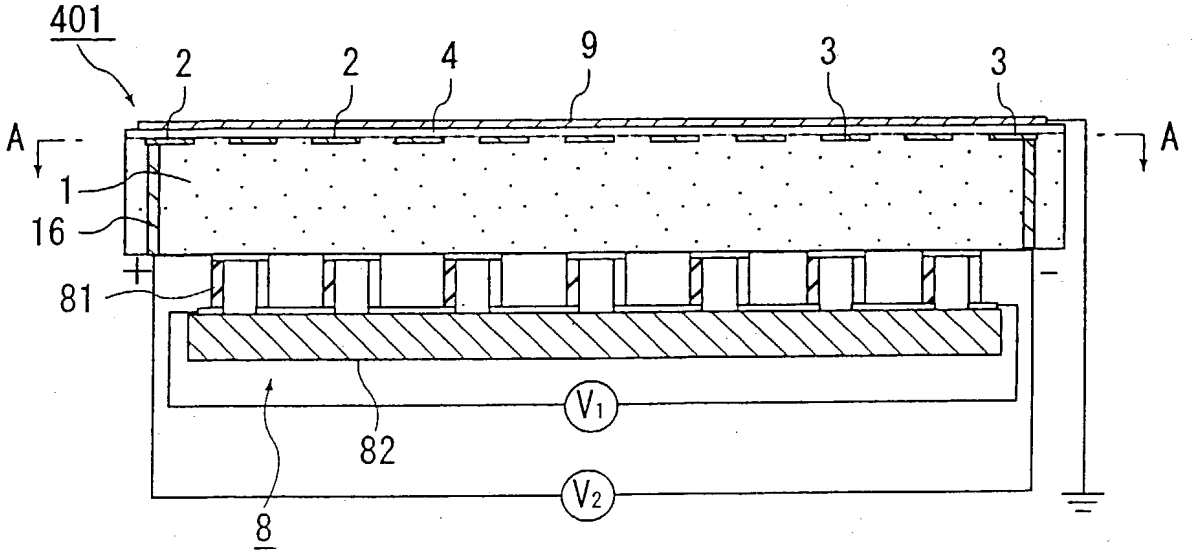


Fig.7

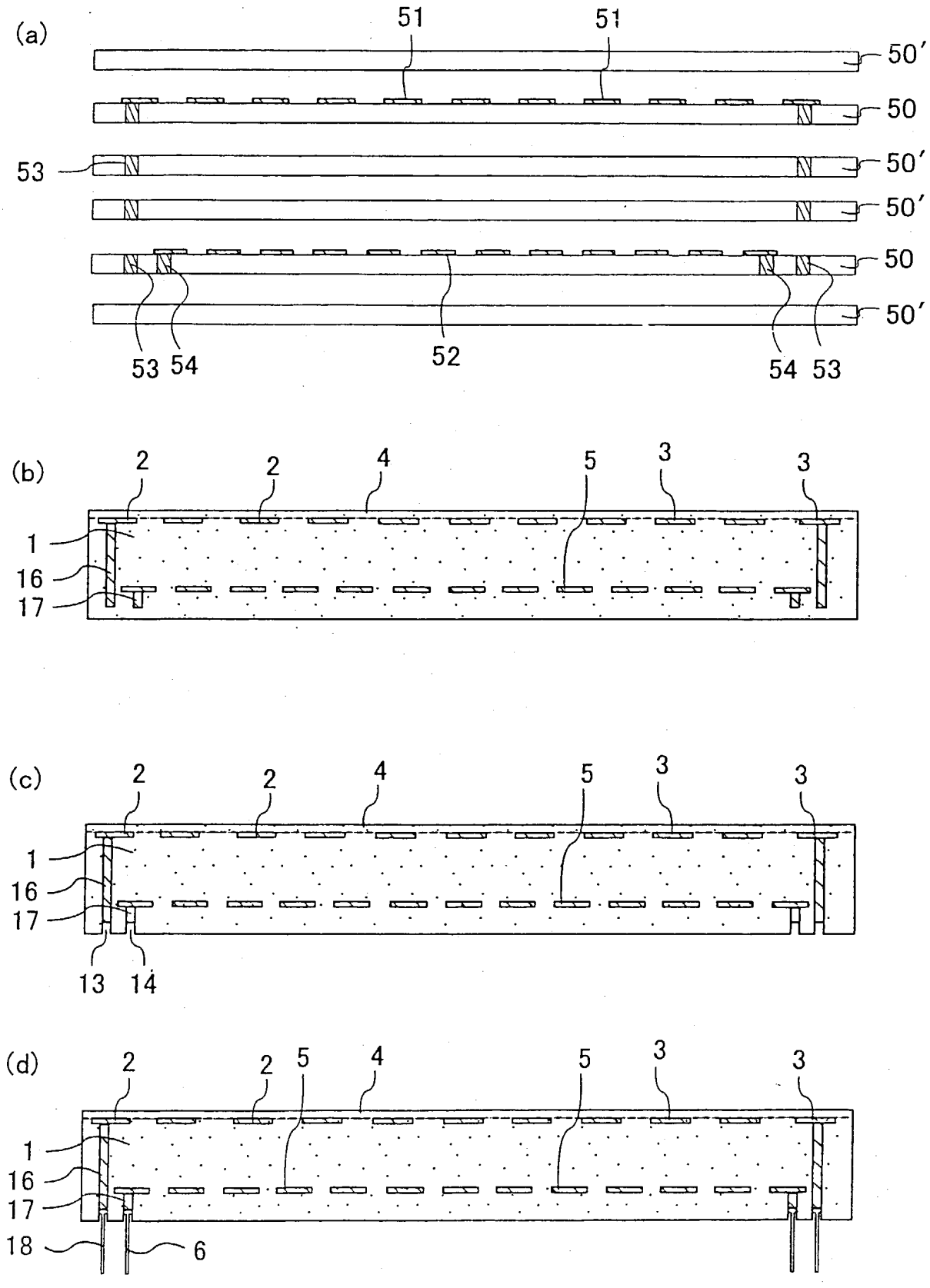

(a)
51
51
50′
50
53
50′
50′
50
50′
53
54
52
54
53
(b)
2
2
4
5
3
3
1
16
17
(c)
2
2
4
5
3
3
1
16
17
13
14
(d)
2
2
5
4
5
3
3
1
16
17
18
6

Fig. 8

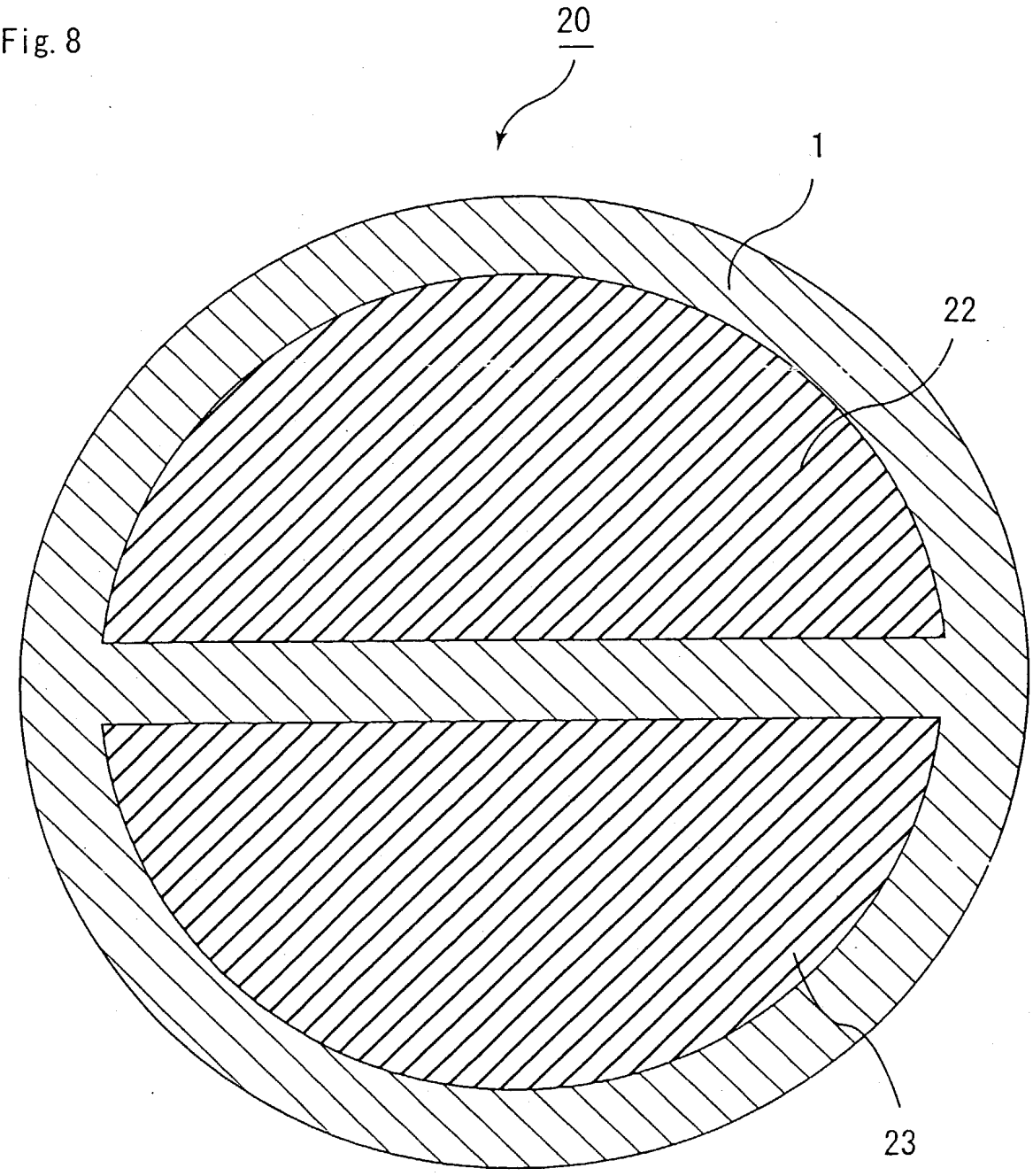


Fig. 9

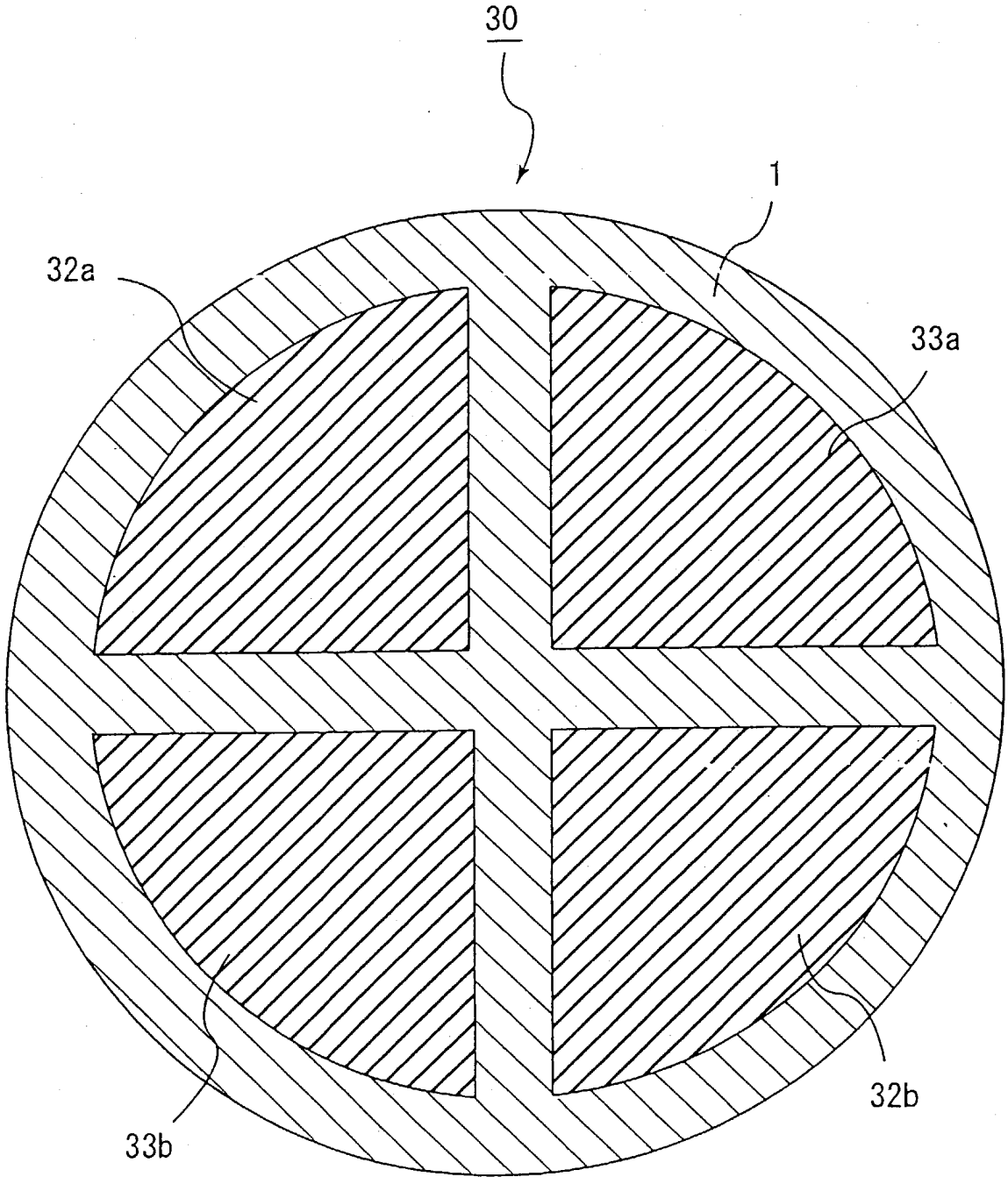


Fig. 10

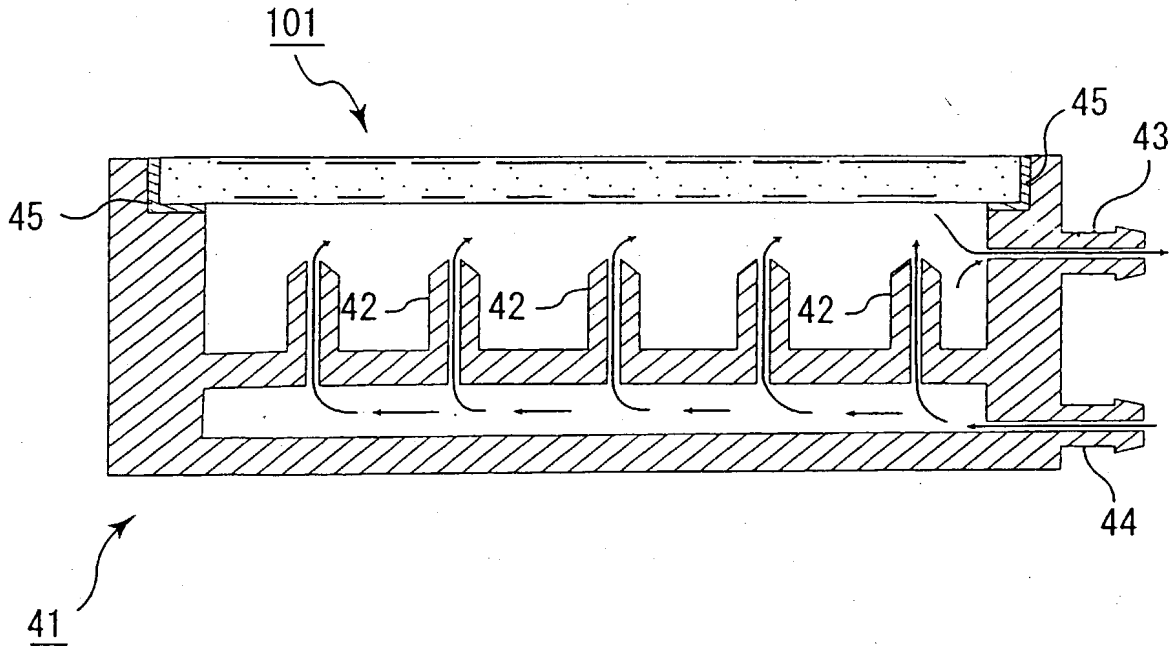


Fig. 11

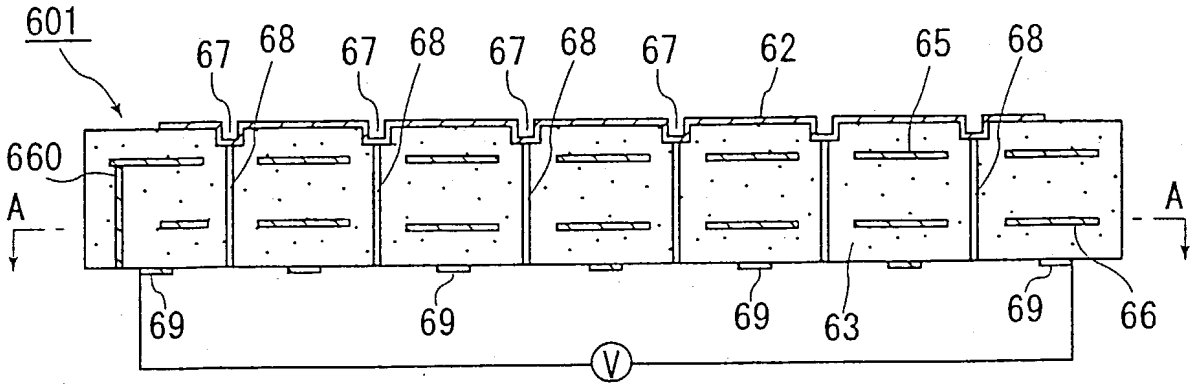

601
67
68
67
68
67
68
67
62
65
68
660
A
A
69
69
69
63
69
66
V

Fig. 12

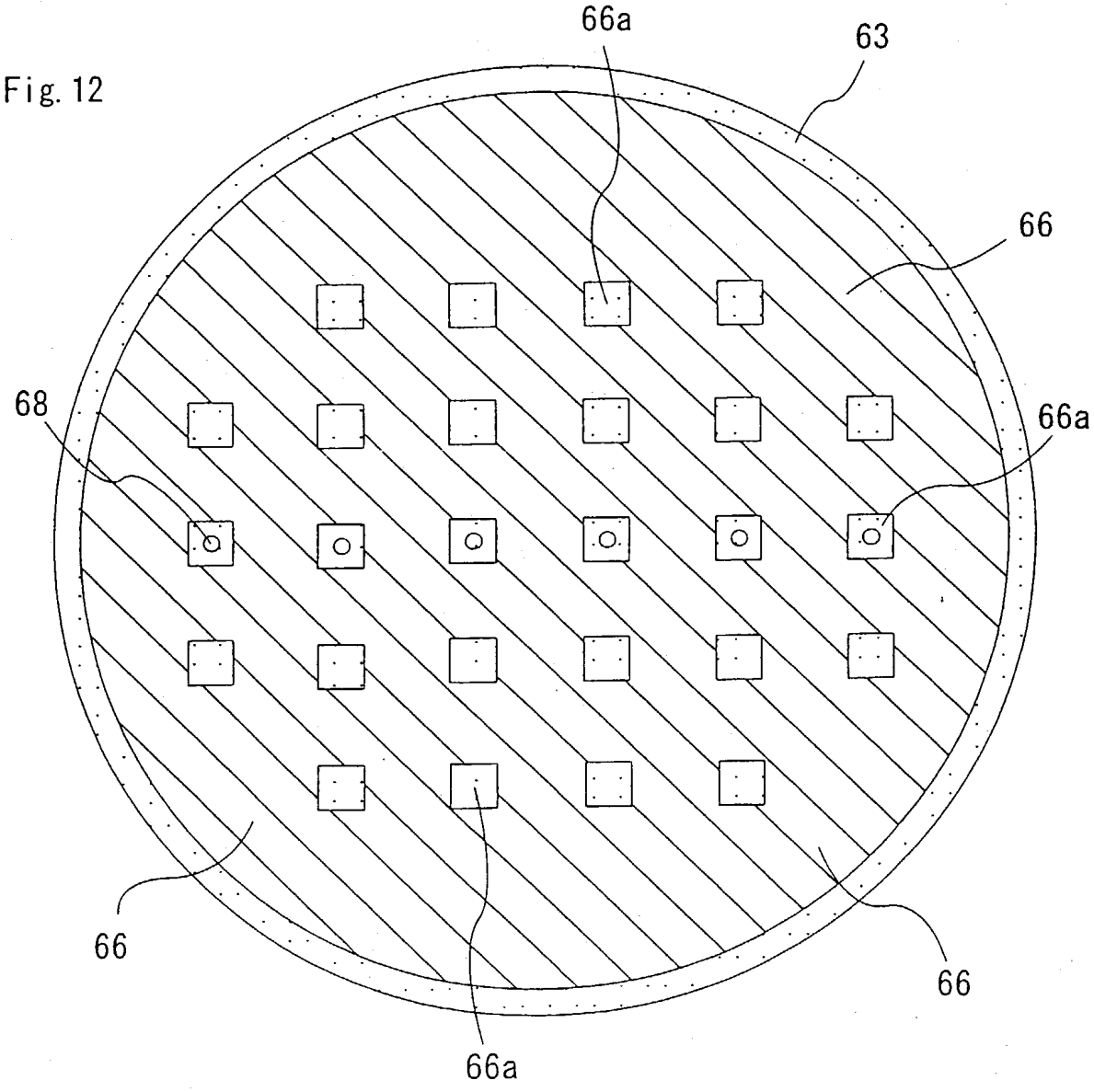

66a
63
66
68
66a
66
66
66a

Fig. 13

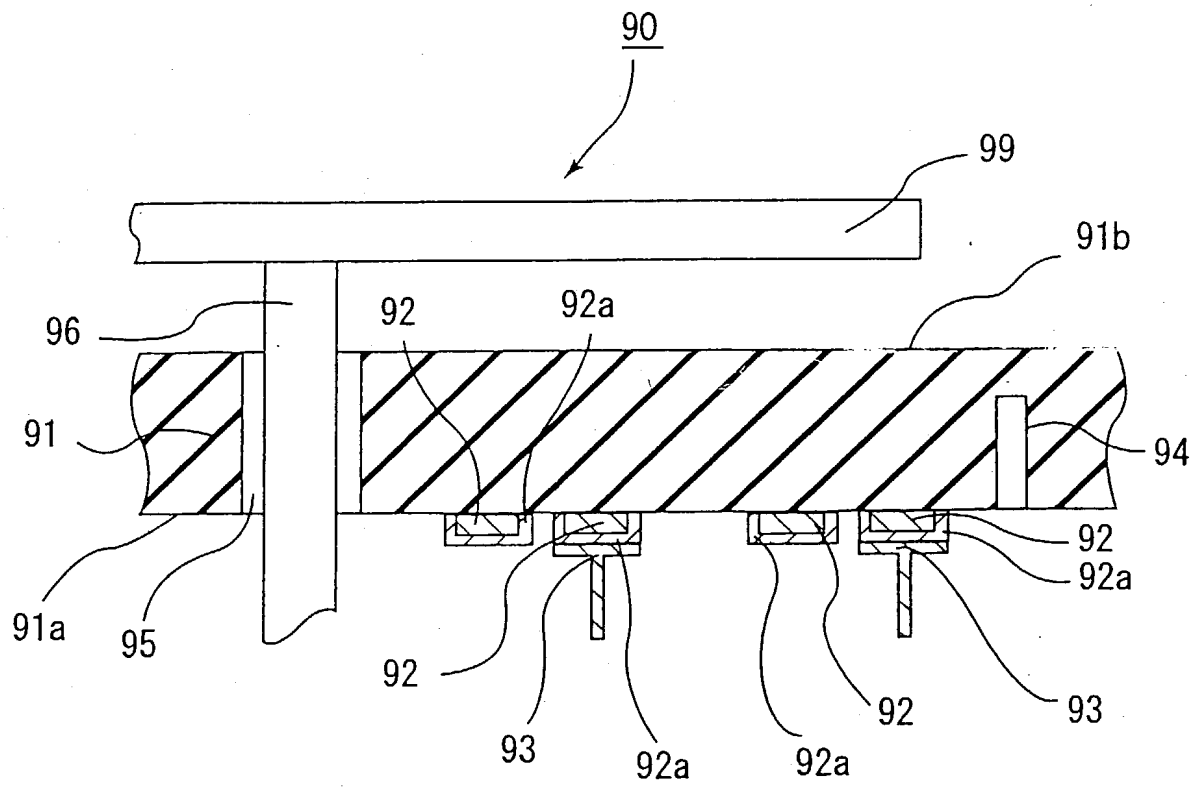


Fig. 1

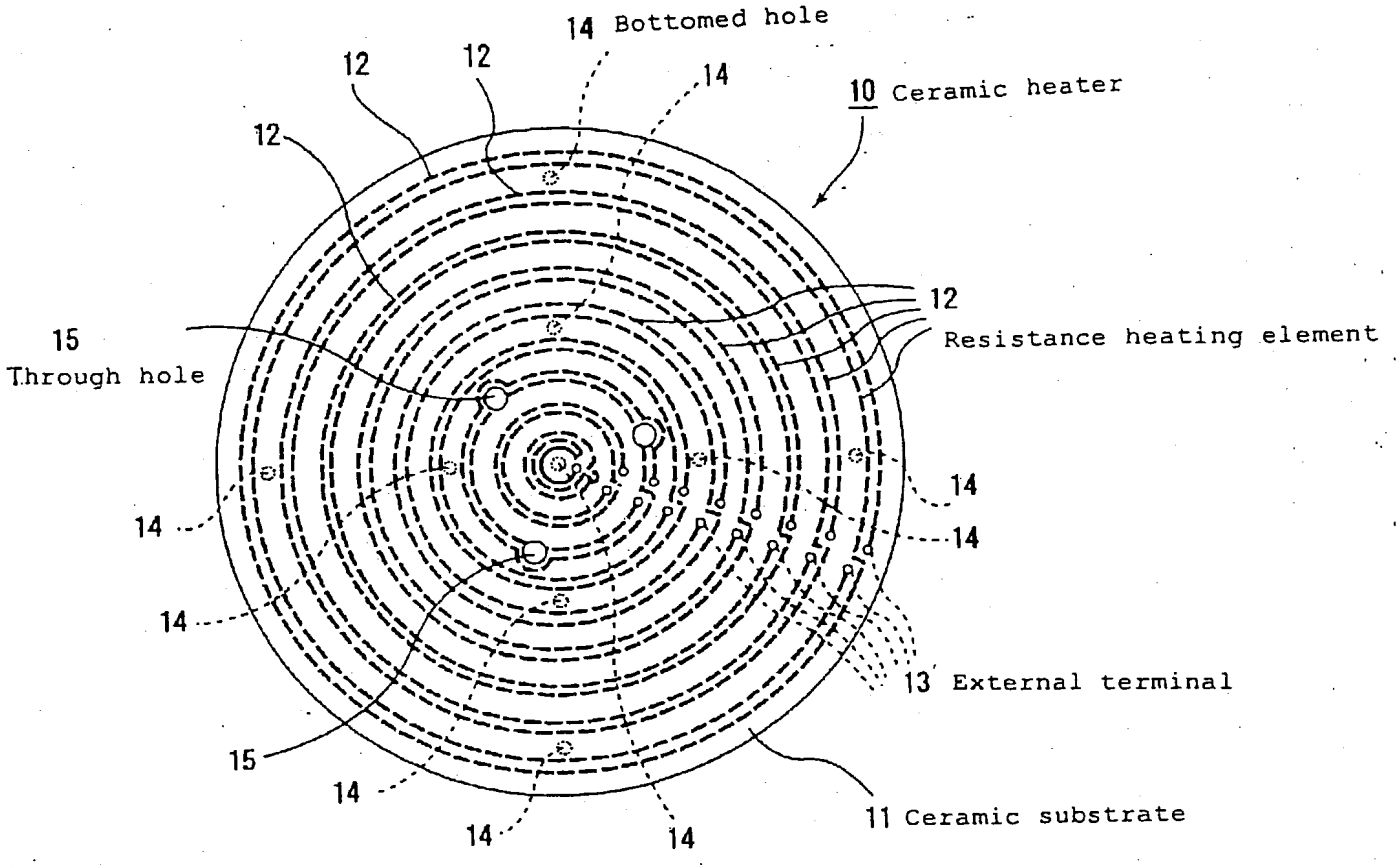

14 Bottomed hole
12
12
14
10 Ceramic heater
12
12
15
Through hole
Resistance heating element
14
14
14
14
13 External terminal
15
14
14
14
11 Ceramic substrate

Fig. 2

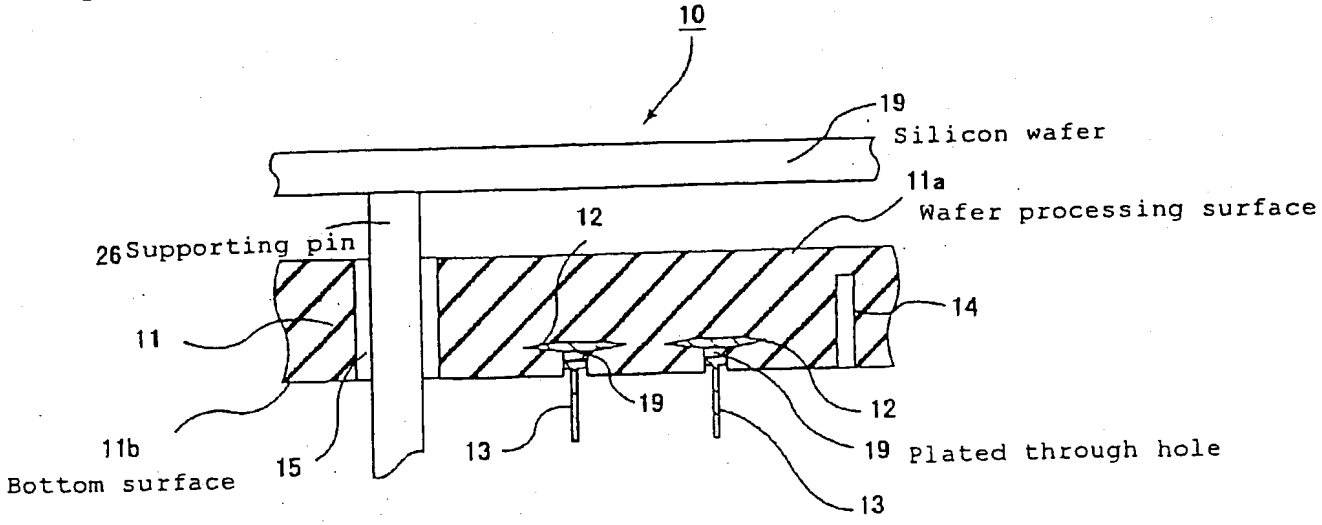

10
19
Silicon wafer
11a
Wafer processing surface
12
26 Supporting pin
14
11
19
12
11b
Bottom surface
15
13
19 Plated through hole
13

Fig. 3

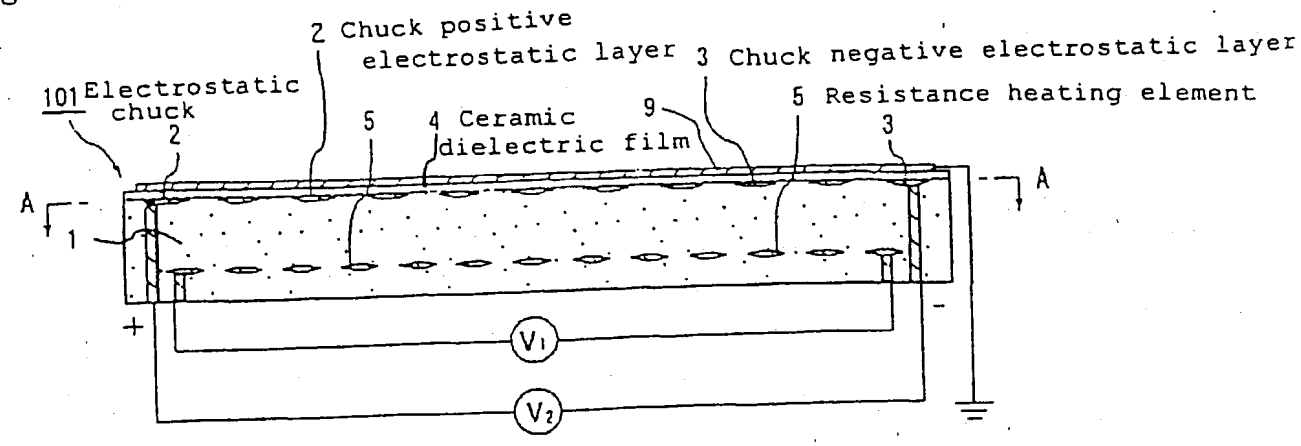

2 Chuck positive electrostatic layer
3 Chuck negative electrostatic layer
101 Electrostatic chuck
2
5
4 Ceramic dielectric film
9
5 Resistance heating element
3
A
A
1
+
-
-
V1
V2

Fig. 4

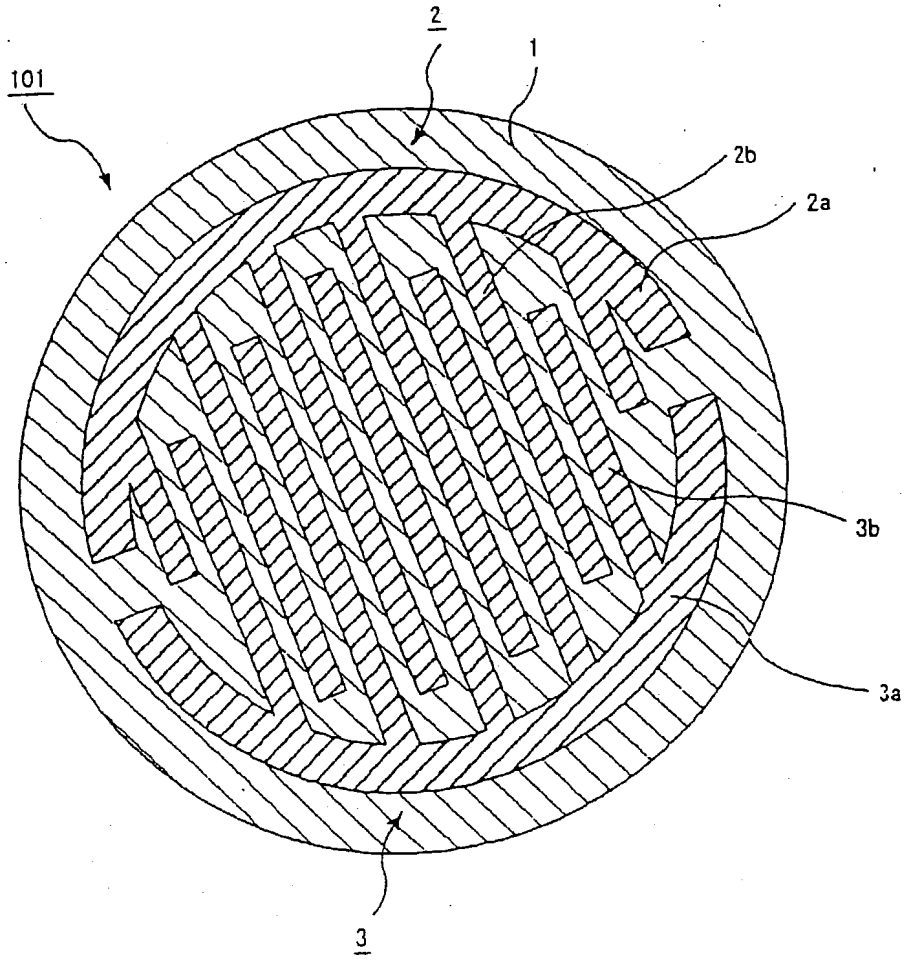

2
1
101
2b
2a
3b
3a
3

Fig. 5

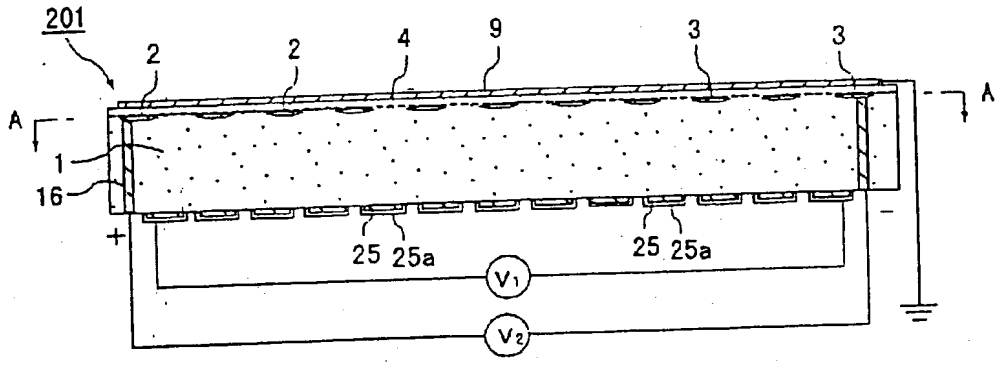


Fig. 6

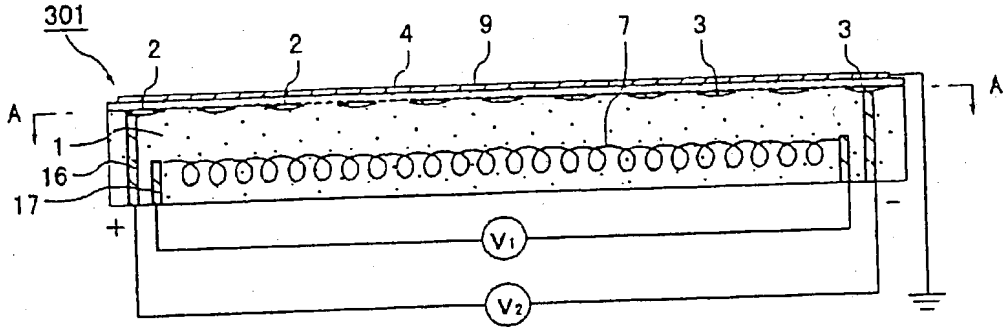


Fig. 7

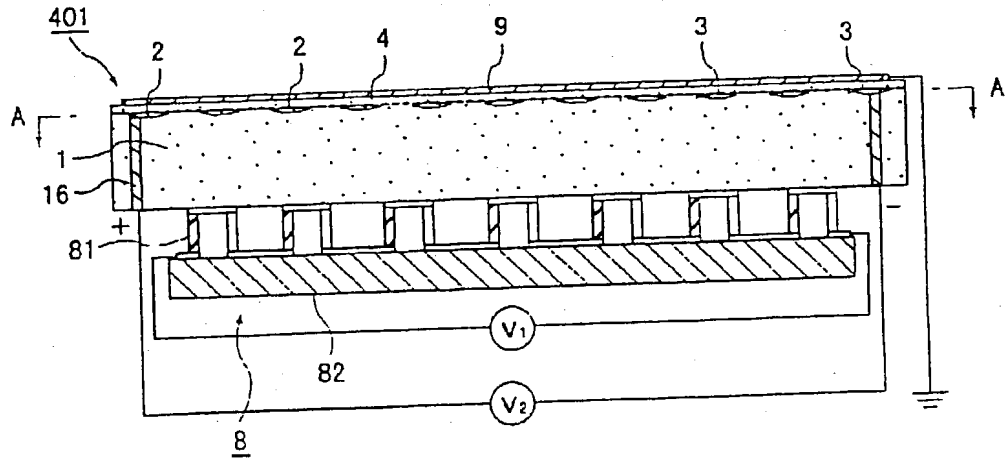


Fig. 8

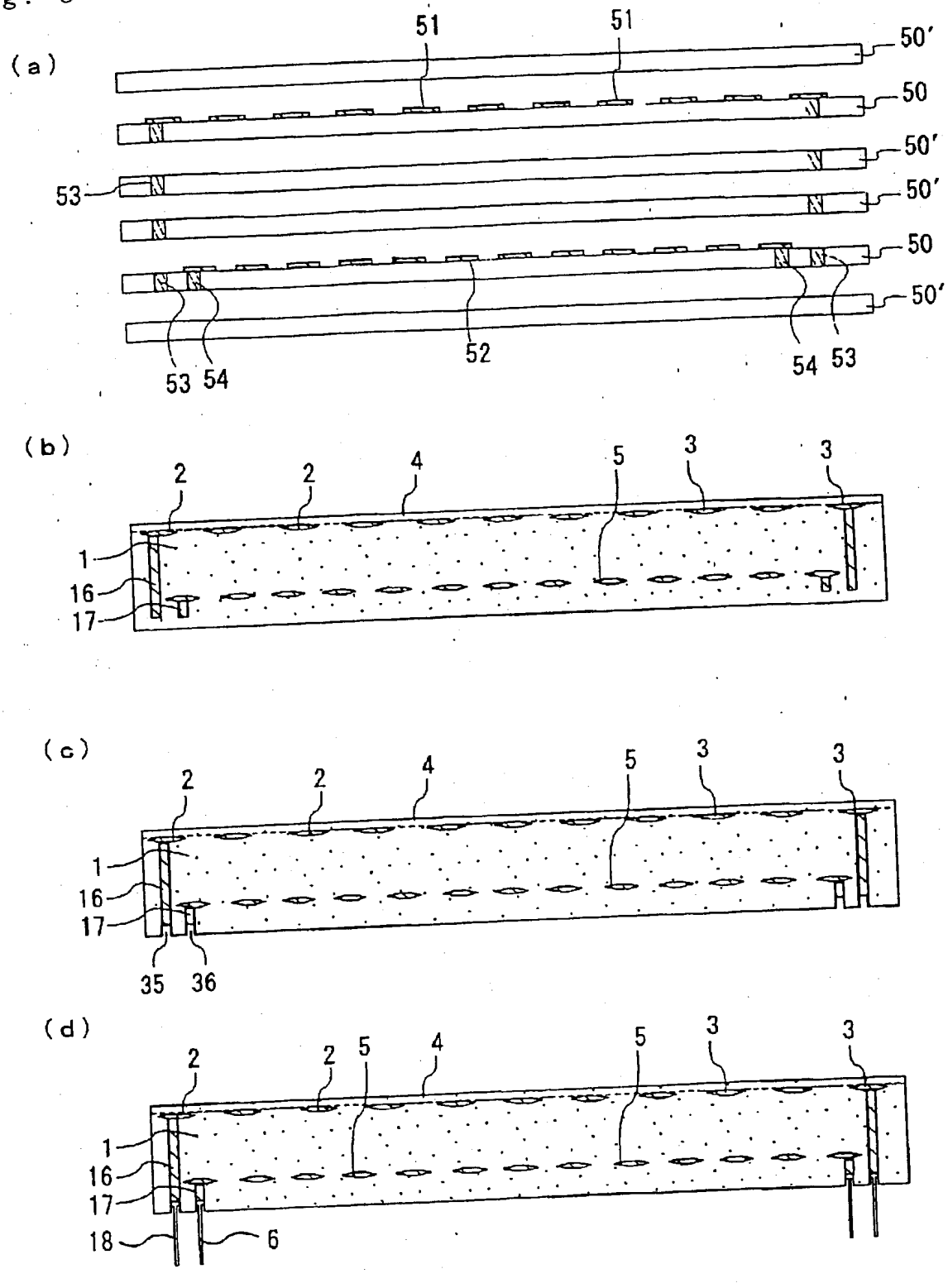

(a)
51
51
50'
50
50'
53
50'
50
50'
53
54
52
54
53
(b)
2
2
4
5
3
3
1
16
17
(c)
2
2
4
5
3
3
1
16
17
35
36
(d)
2
2
5
4
5
3
3
1
16
17
18
6

Fig. 9

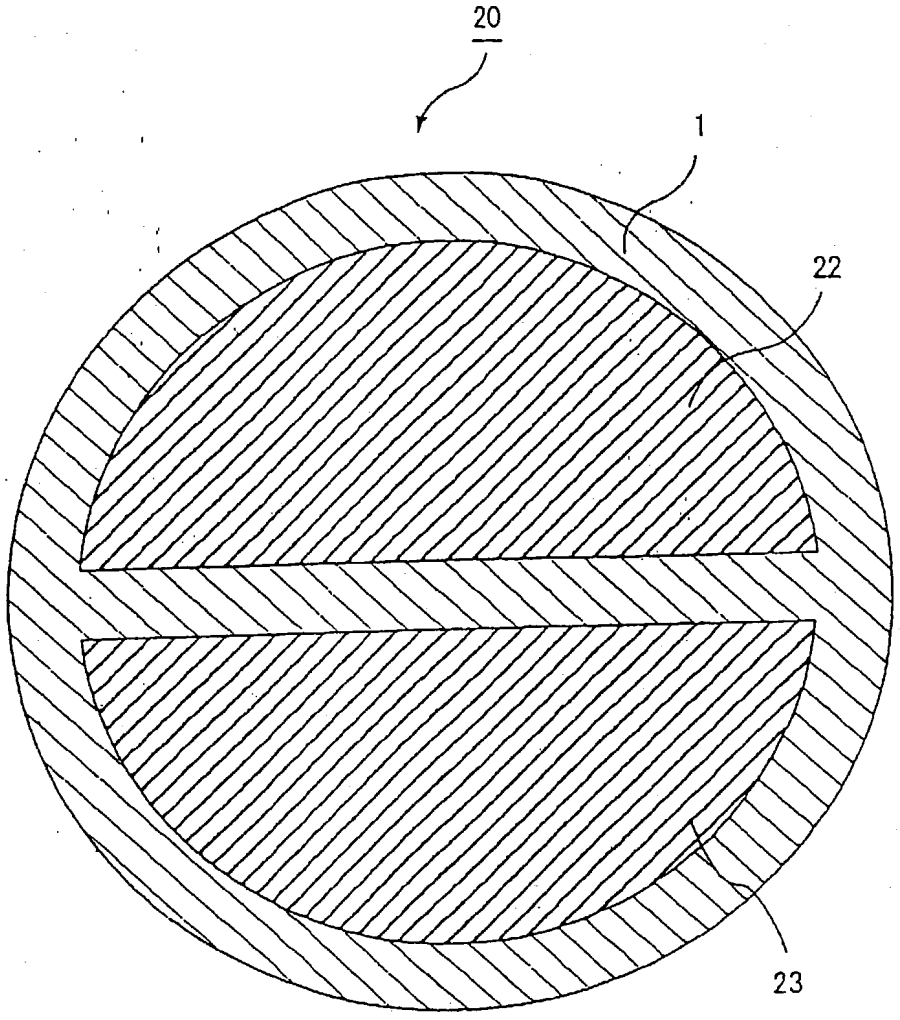


Fig. 10

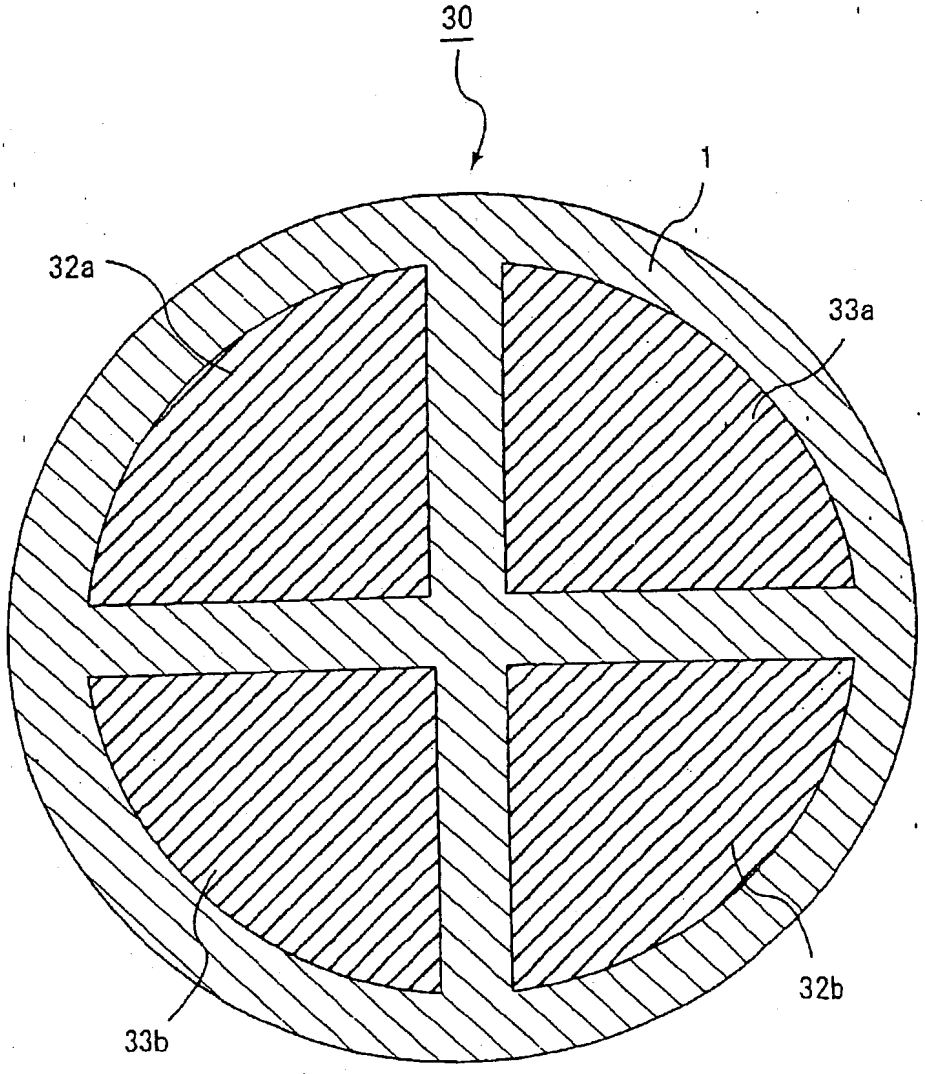


Fig. 11

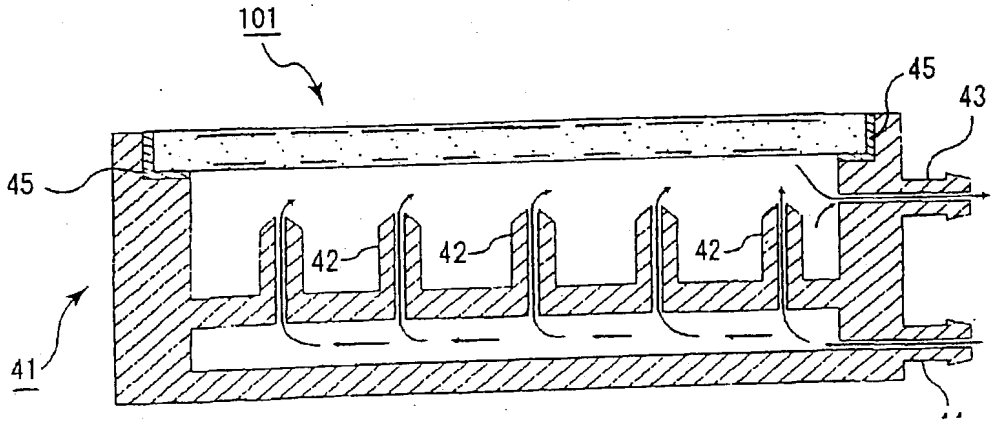


Fig. 12

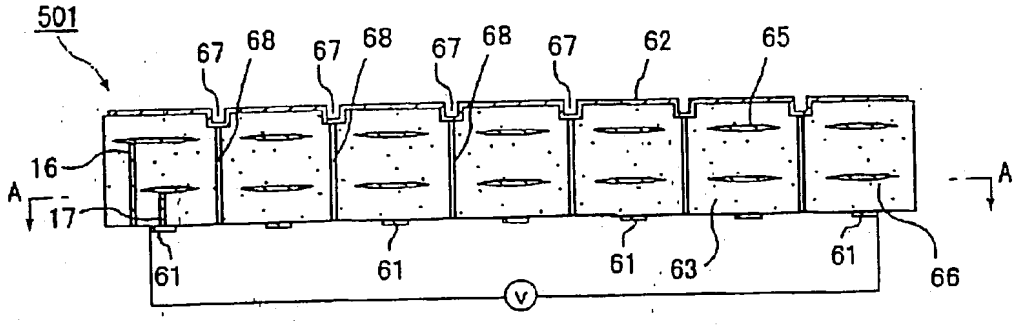

501
67
68
67
68
67
68
67
62
65
16
A
17
A
61
61
61
63
61
66
V

Fig. 13

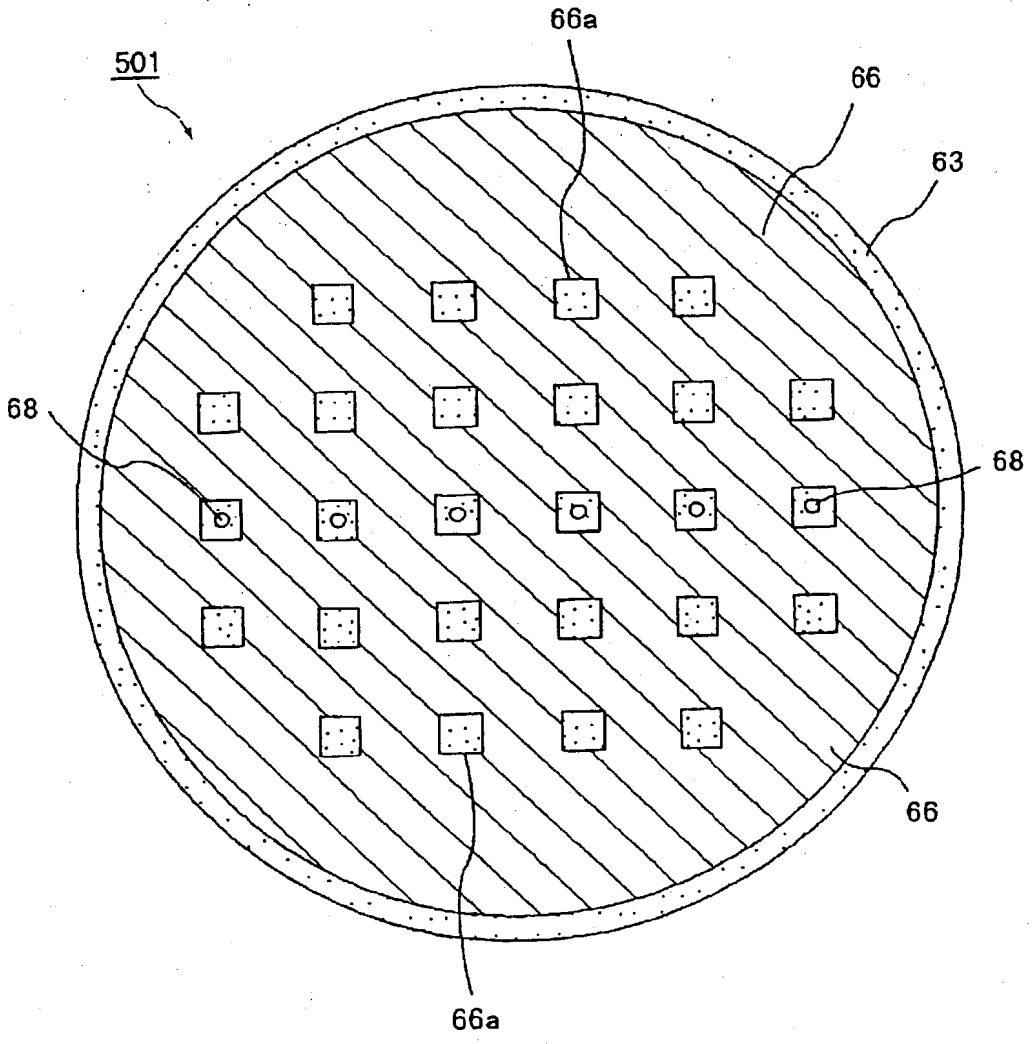

501
66a
66
63
68
68
66
66a

Fig. 14

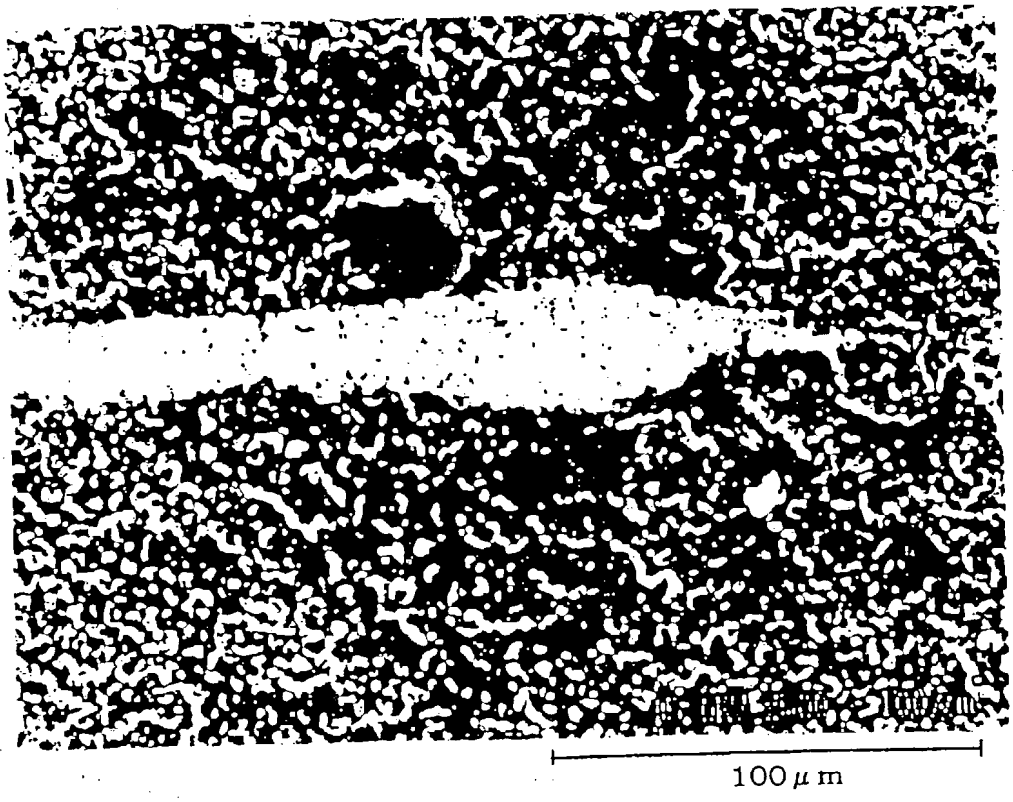


FIG. 1

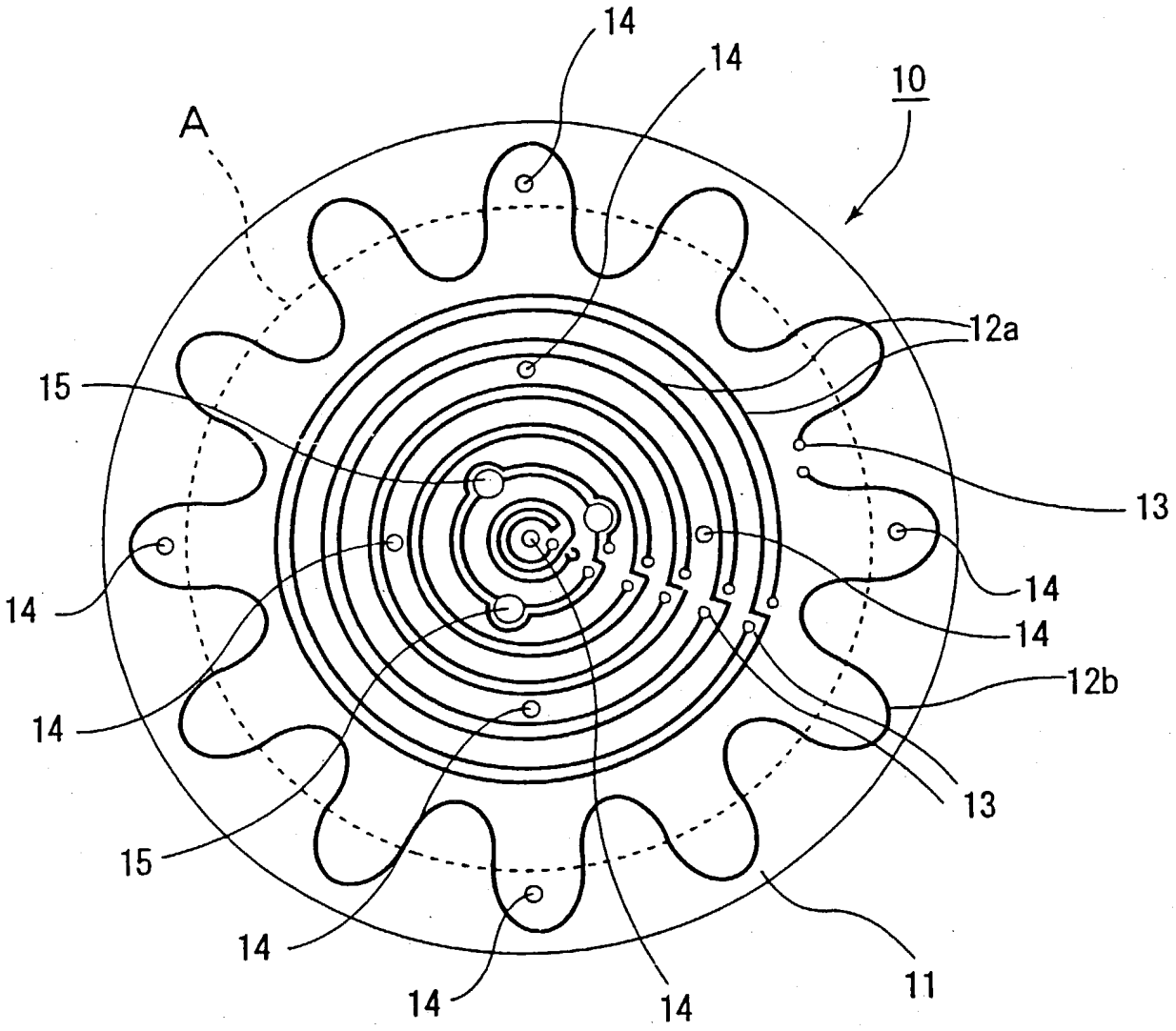


FIG. 2

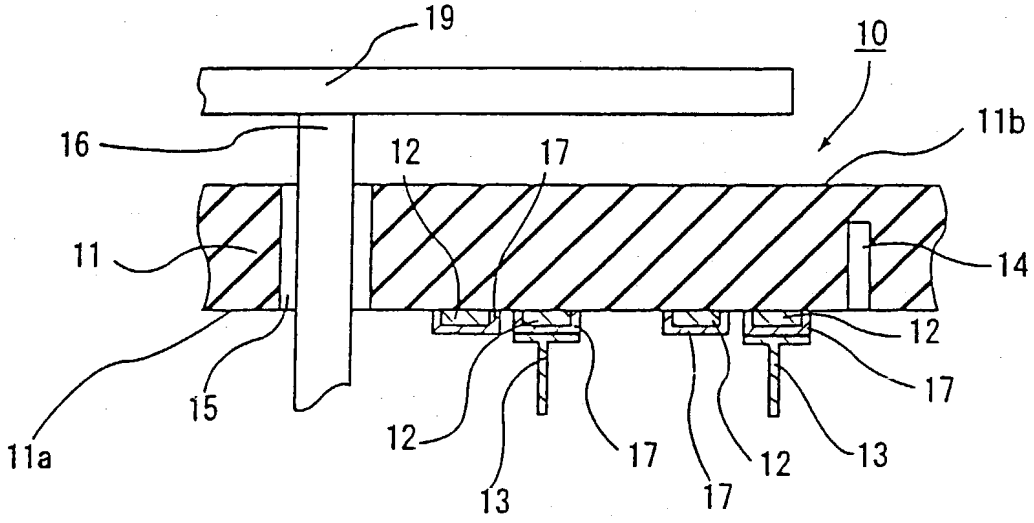

19
10
11b
16
12
17
11
14
12
17
15
12
17
12
13
11a
13
17

FIG. 3

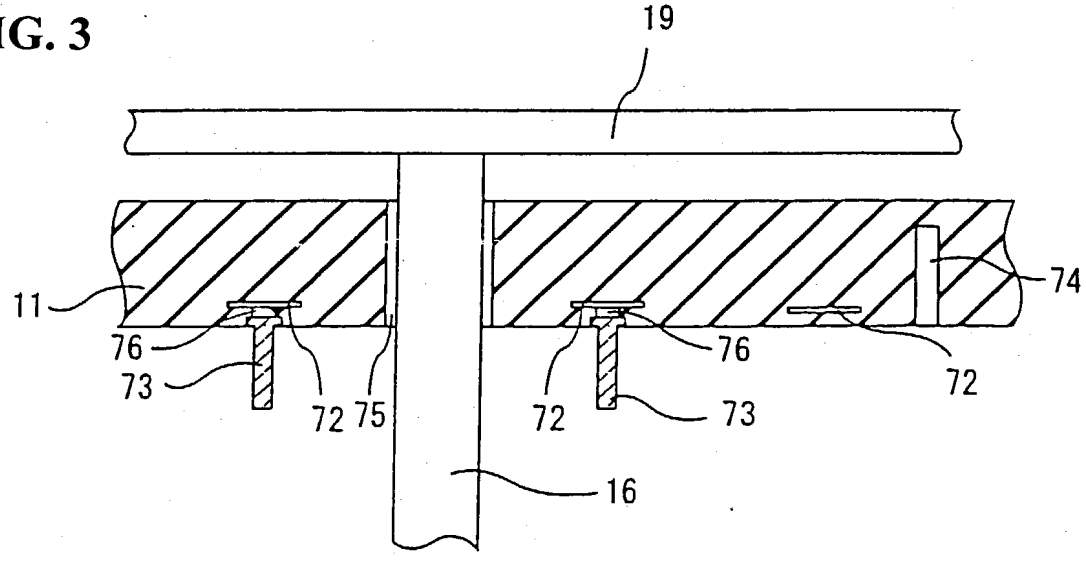

19
11
74
76
76
73
72
72
75
72
73
16

FIG. 4

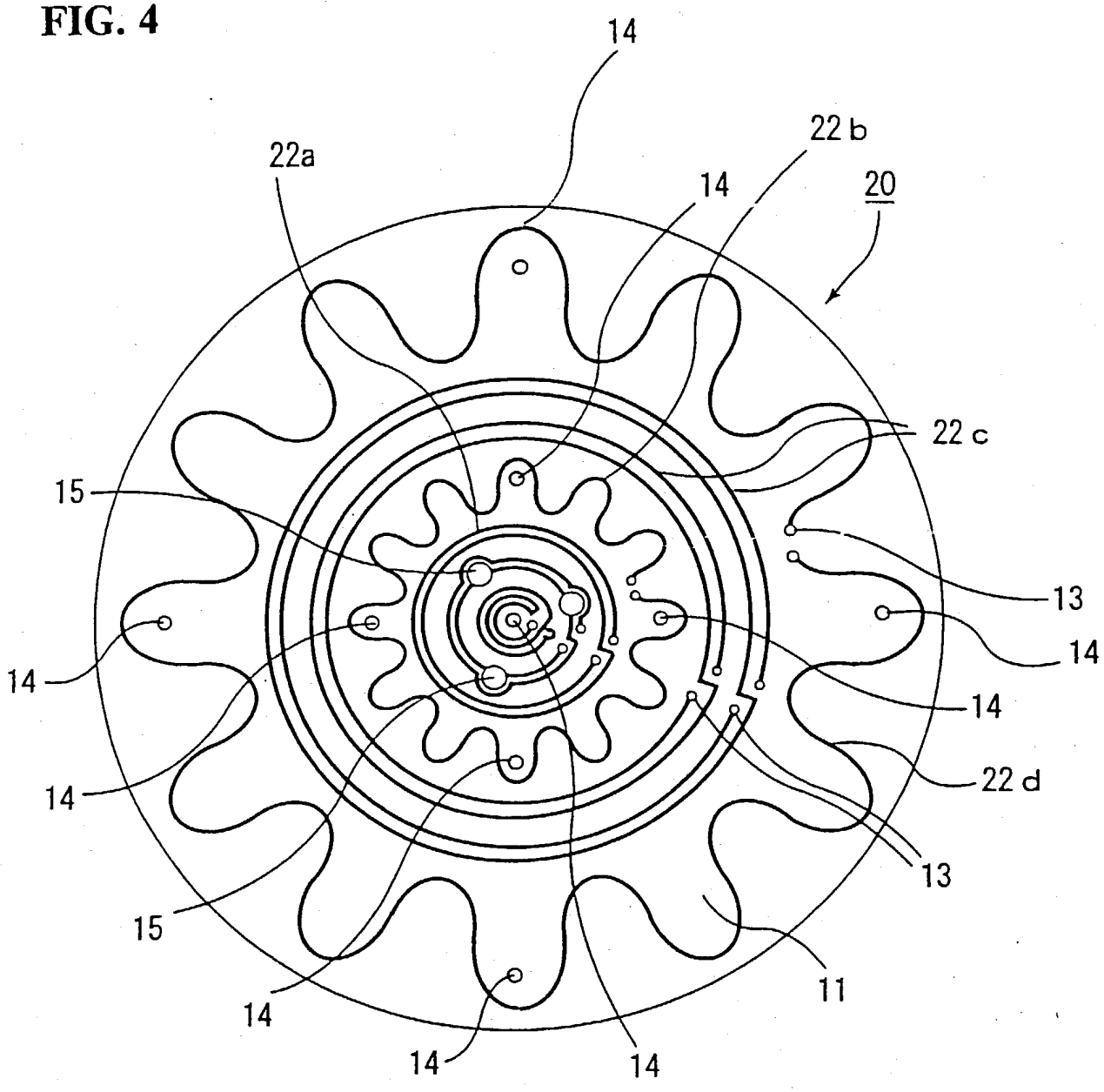
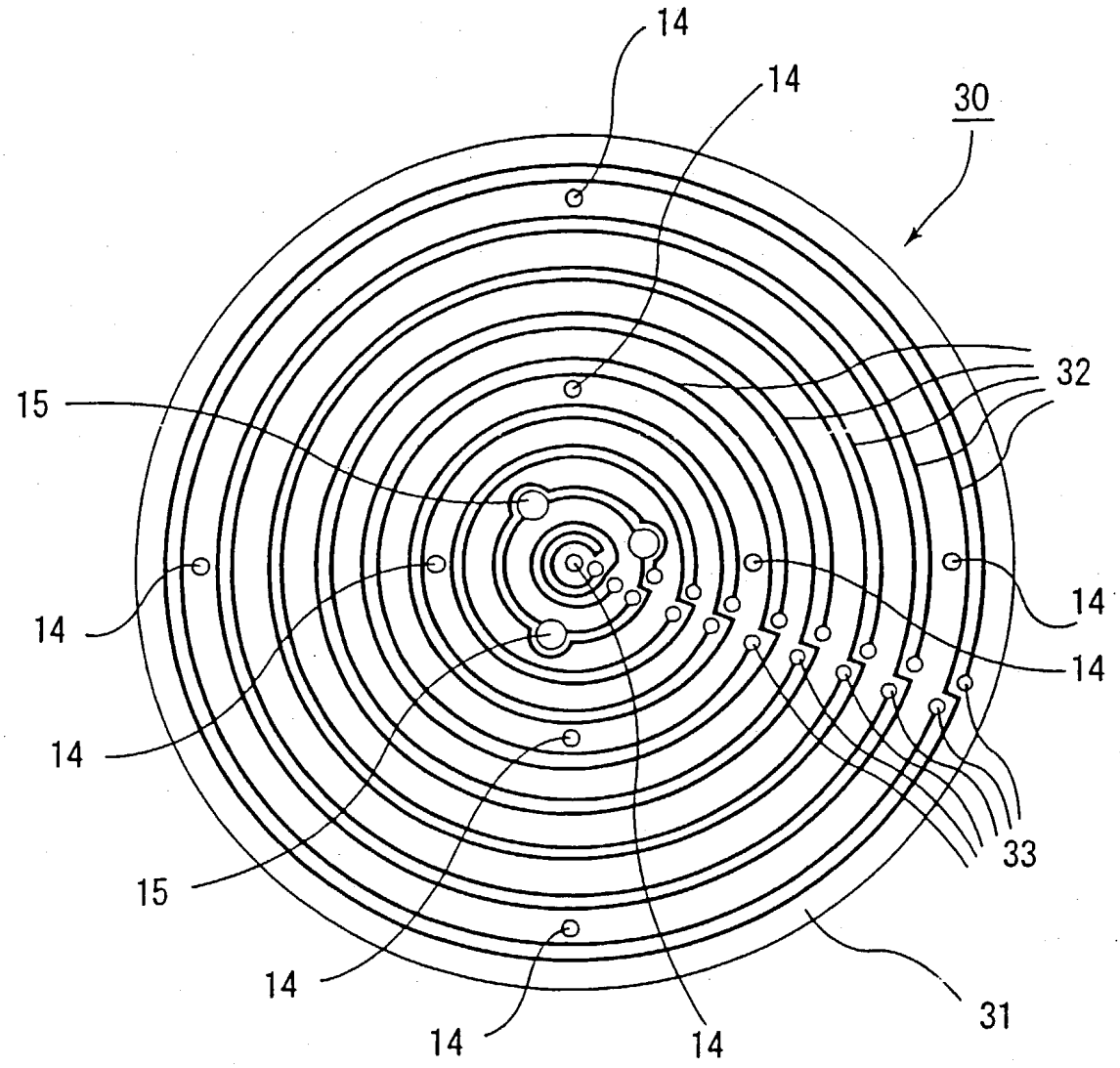


FIG. 5



PRIOR ART

FIG. 6

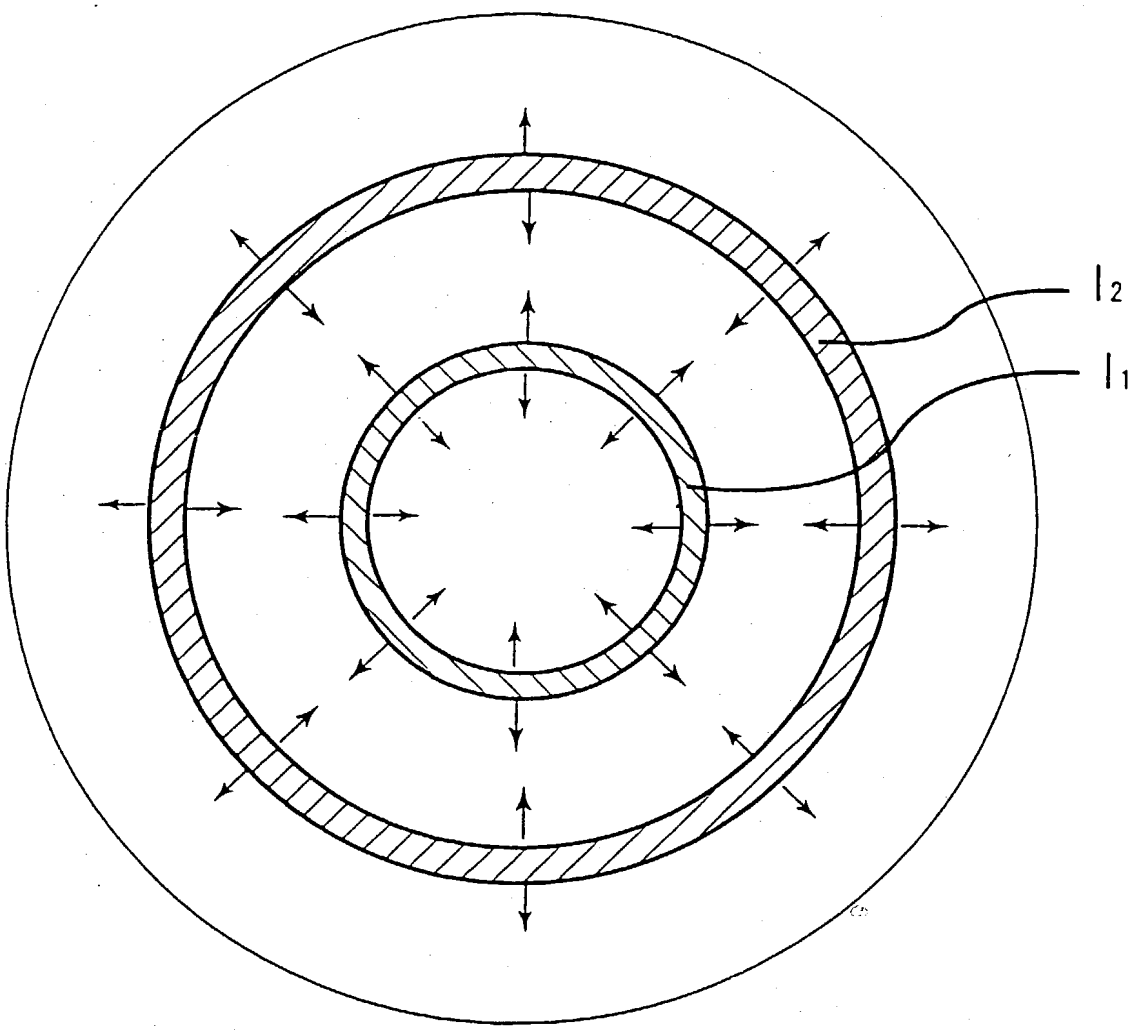


FIG. 7

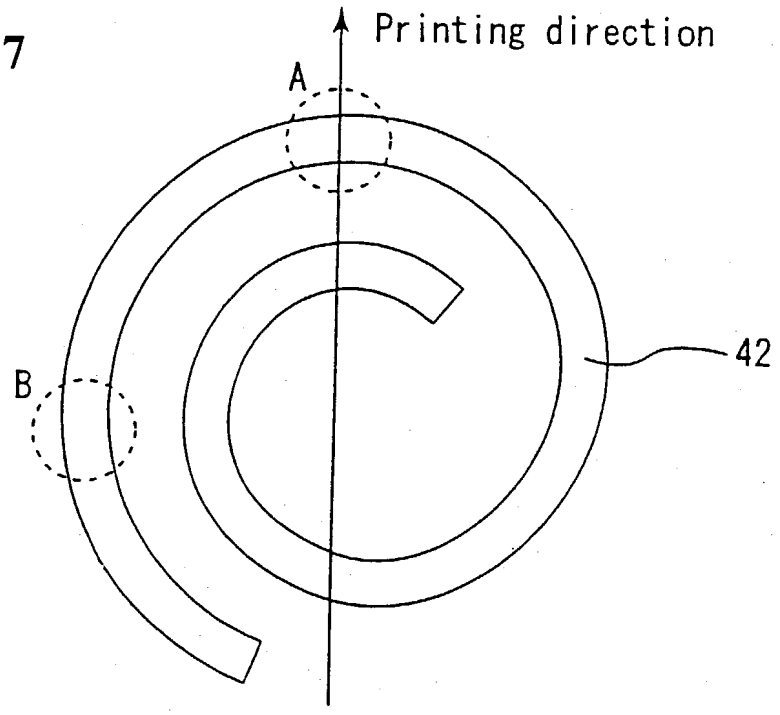


FIG. 8

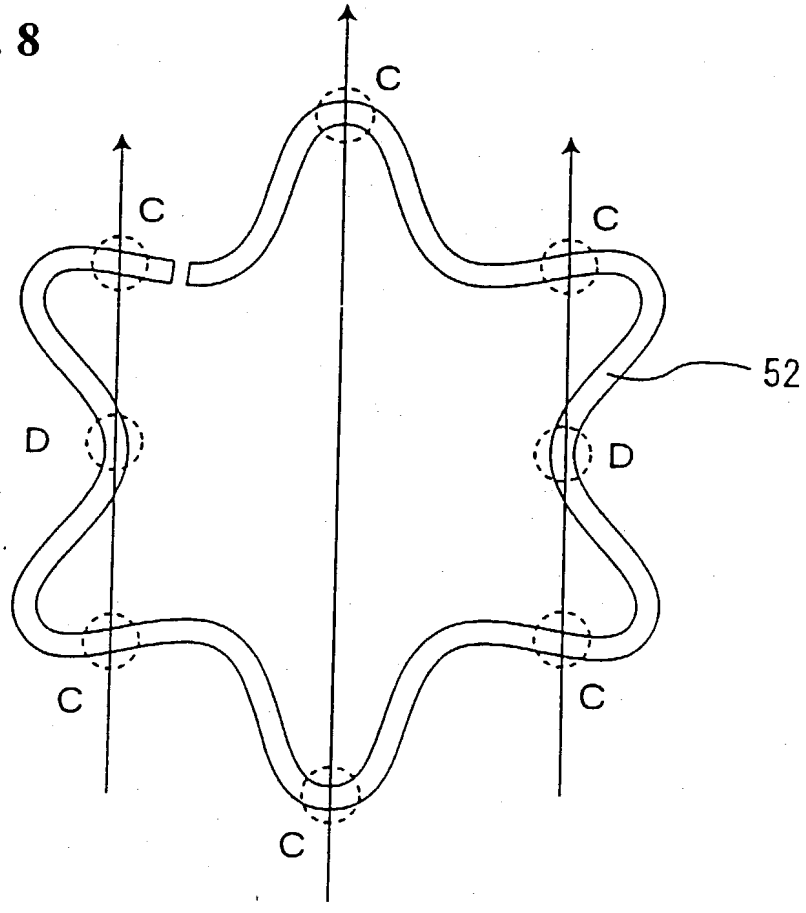


FIG. 9

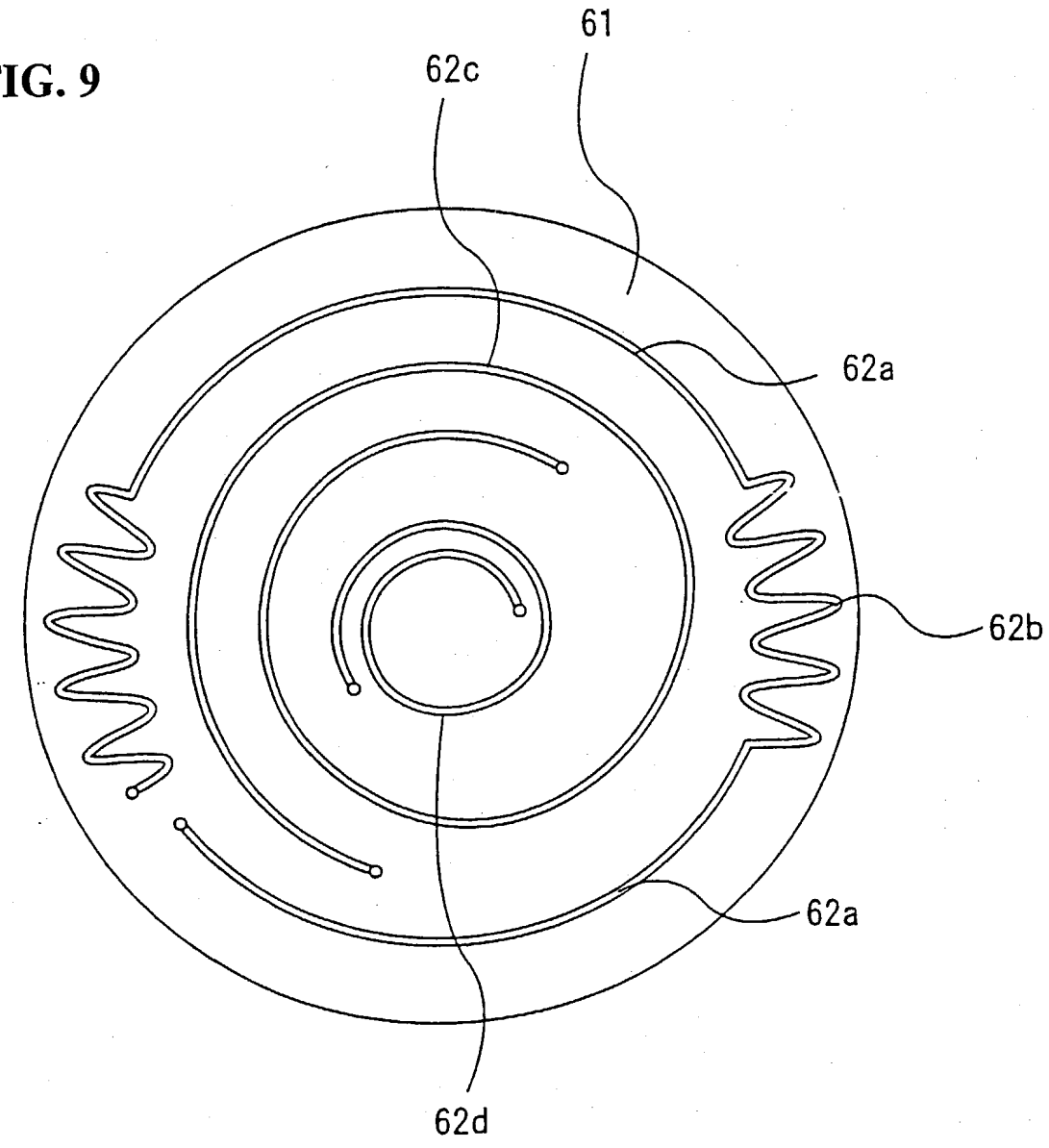


Fig. 1

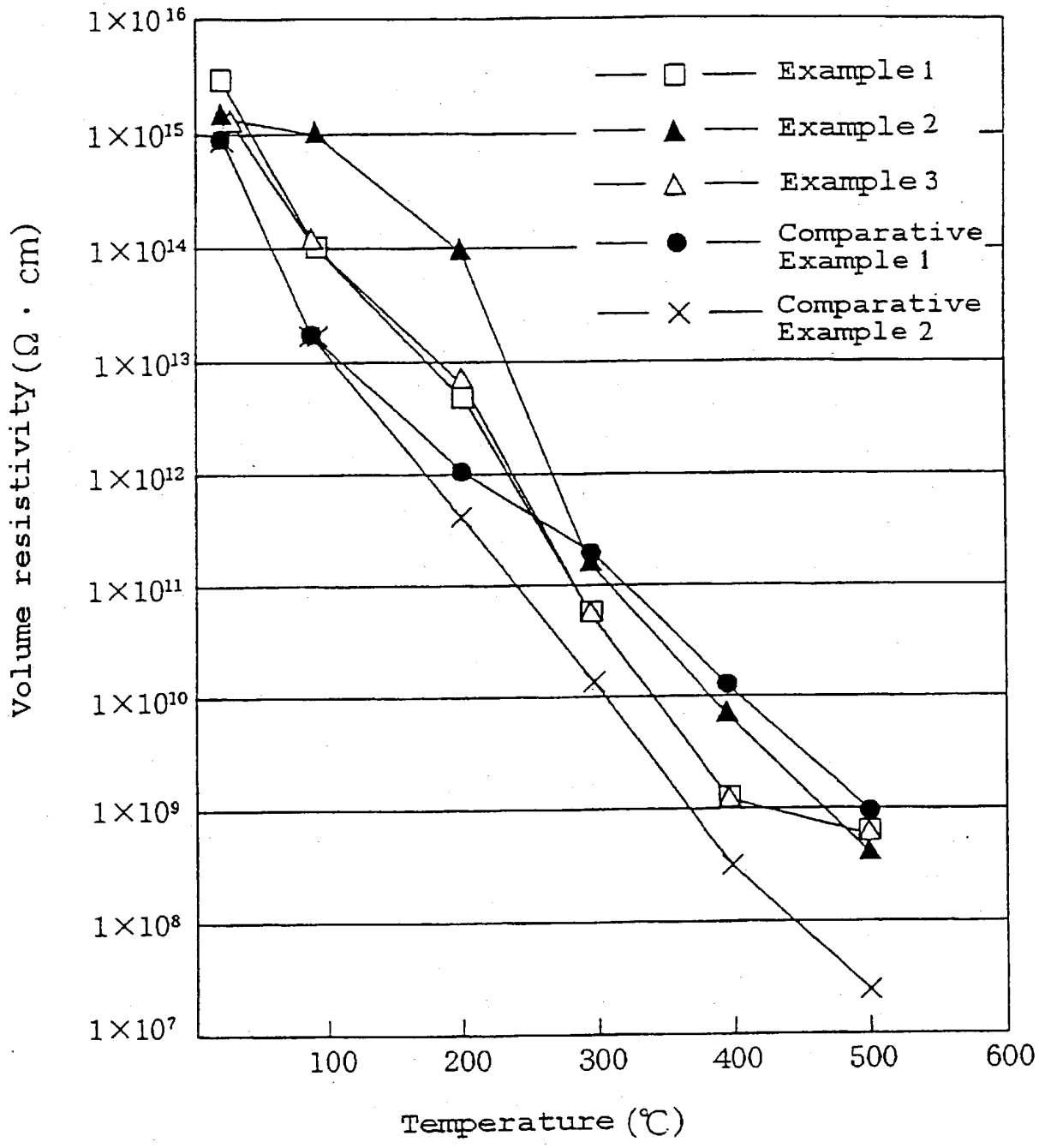
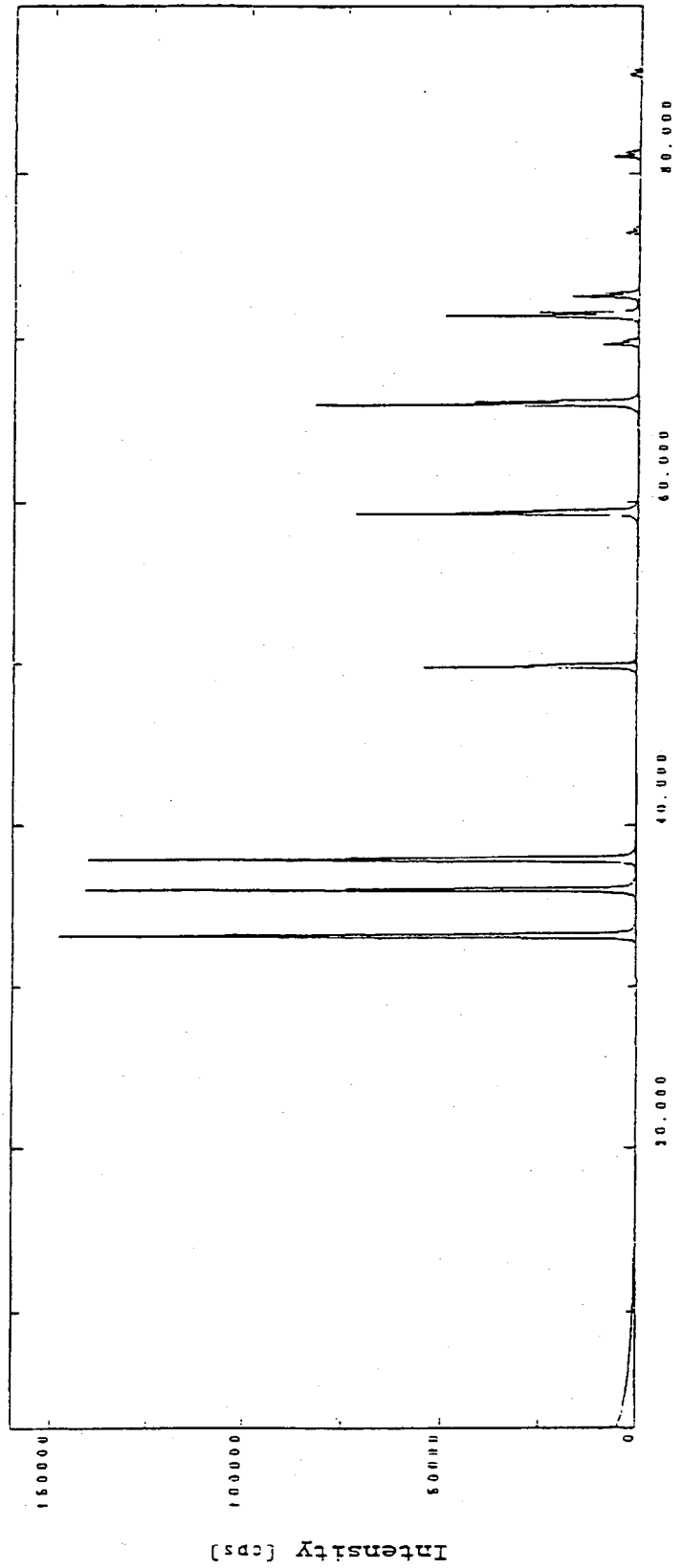

1×10^16
1×10^15
1×10^14
1×10^13
1×10^12
1×10^11
1×10^10
1×10^9
1×10^8
1×10^7
Volume resistivity (Ω・cm)
100
200
300
400
500
600
Temperature (℃)
Example 1
Example 2
Example 3
Comparative Example 1
Comparative Example 2

Fig. 2



Sample name	: Outside	X-rays	: Cu K-ALPHA/ 50 kV/ 300 mA	Counter	: Scintillation counter
File	: T990603.0339	Goniometer	: RINT 2000 wide angle goniometer		
Comments	: Wide angle measurement	Attachment	: Standard sample holder		
Date of measurement	: 03-Jun-99 15:59	Filter	: Not used	Scanning mode	: Continuous
Measurer	: R I N T	Incident monochrome	:	Scanning speed	: 2.000 °/min.
		Counter monochrometer	: Full automatic monochrometer	Scanning step	: 0.020 °
		Divergent slit	: "1deg."	Scanning axis	: 2θ/θ
		scattering slit	: "1deg."	Scanning range	: 3.000 ~ 90.000 °
		Light-receiving slit	: "0.3mm"	θ offset	: 0.000 °

Fig. 3

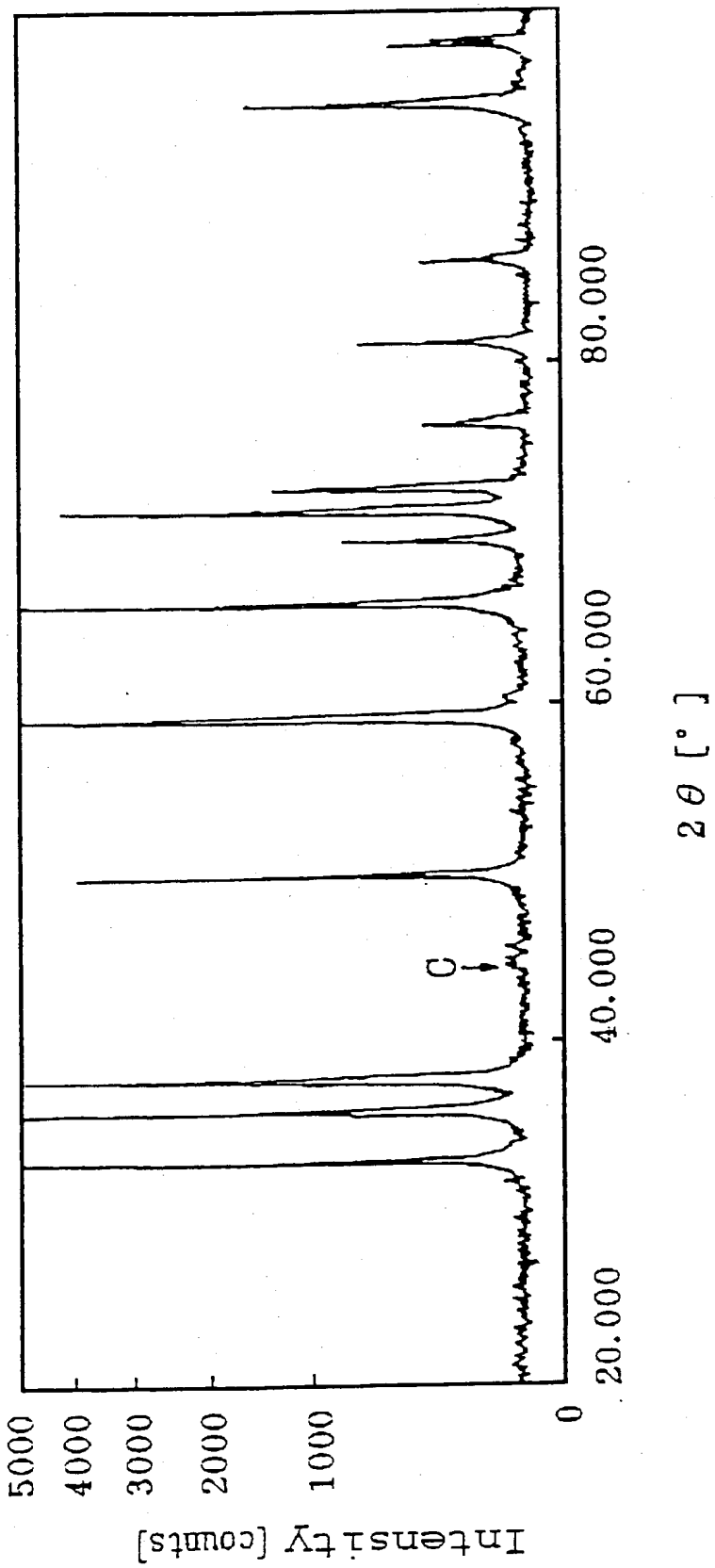

Intensity [counts]
5000
4000
3000
2000
1000
0
20.000
40.000
60.000
80.000
2θ [°]
C

Fig. 4

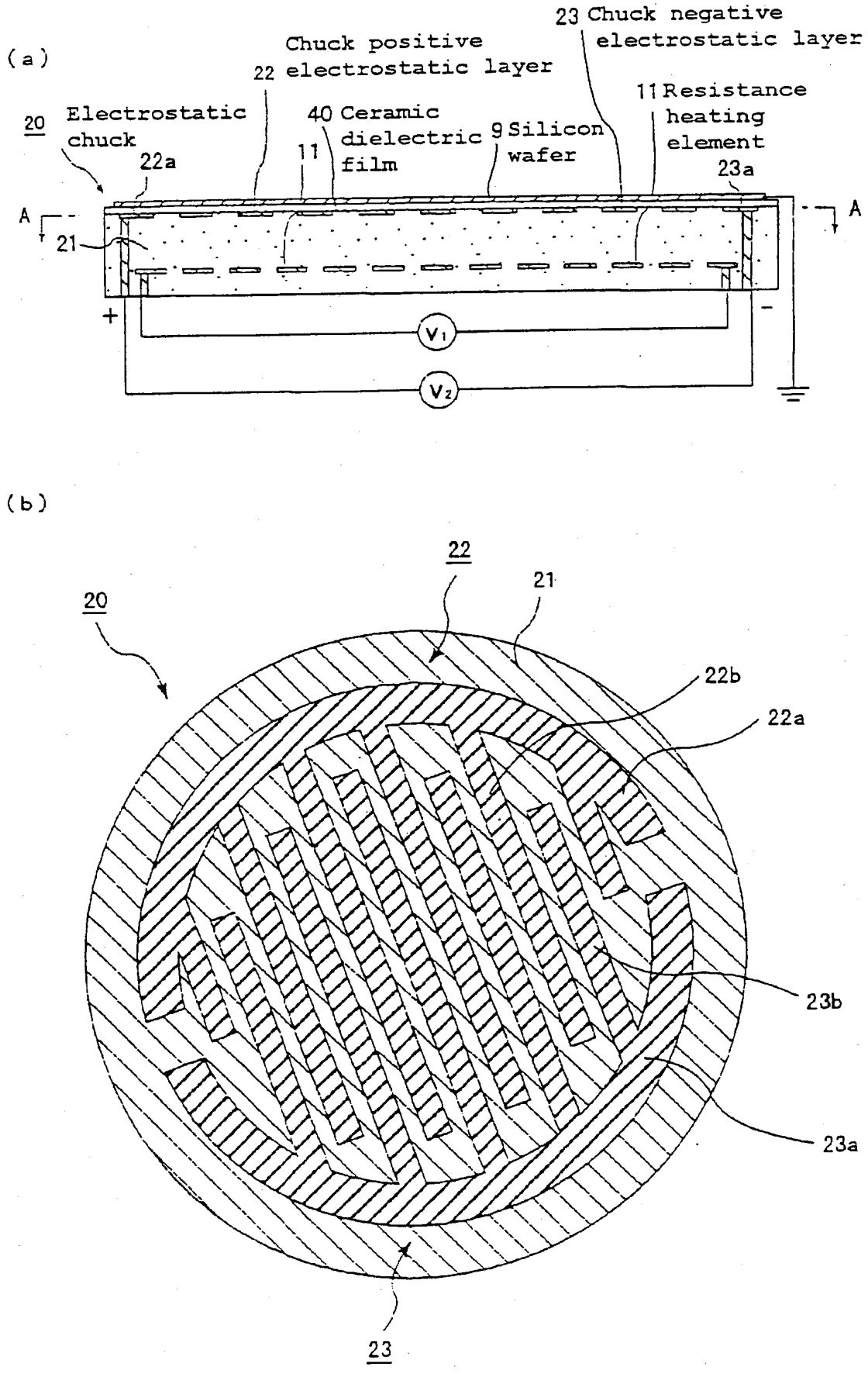

(a)
20 Electrostatic chuck
22a
22 Chuck positive electrostatic layer
11
40 Ceramic dielectric film
9 Silicon wafer
23 Chuck negative electrostatic layer
11 Resistance heating element
23a
A
A
21
+
−
V1
V2
(b)
22
21
20
22b
22a
23b
23a
23

Fig. 5

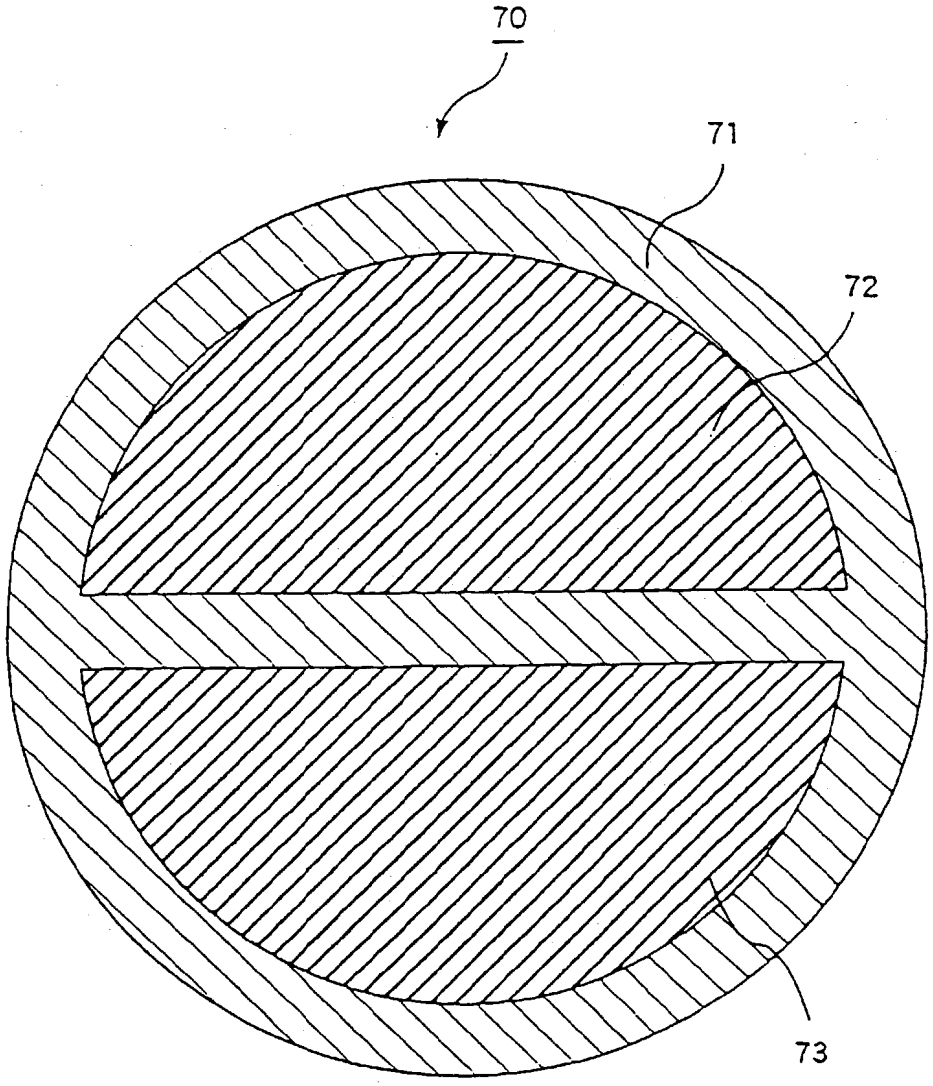


Fig. 6

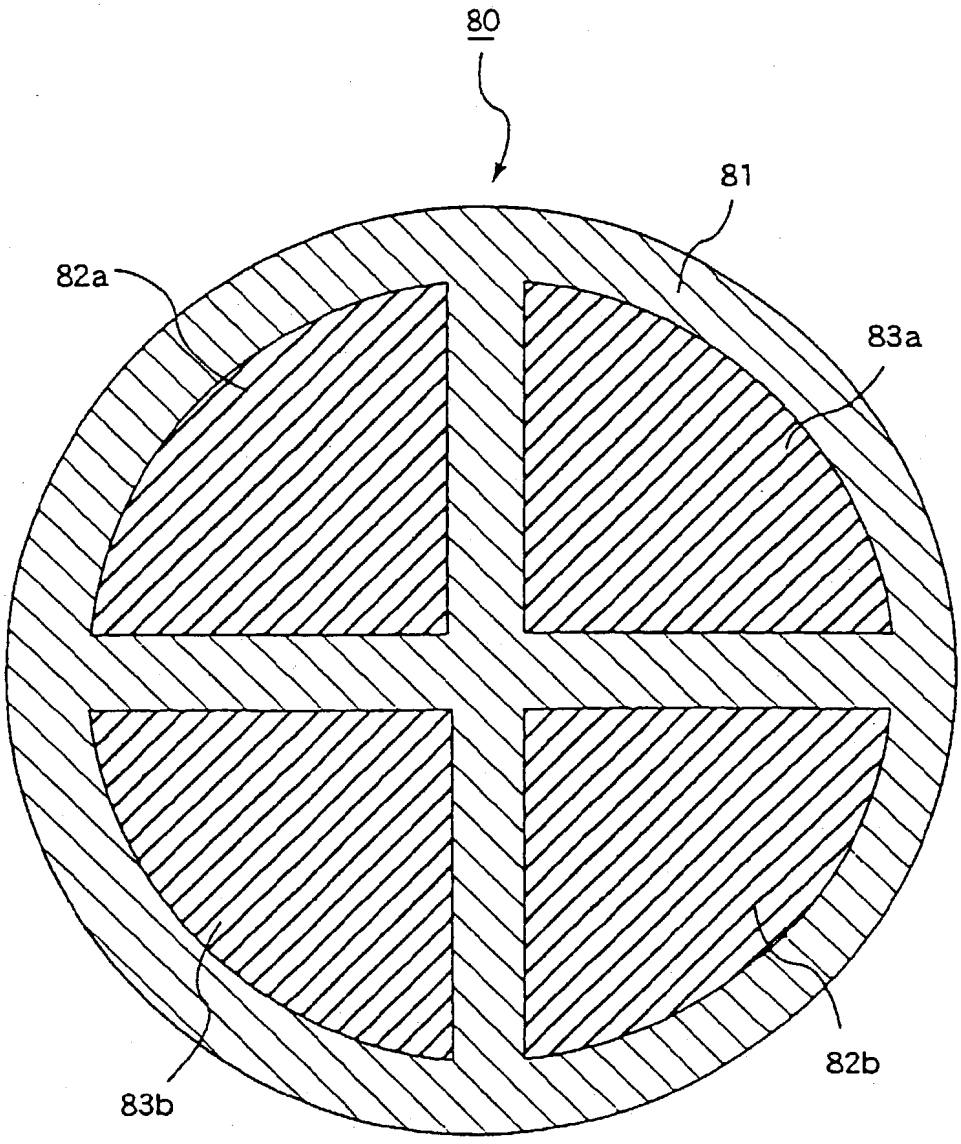


Fig. 7

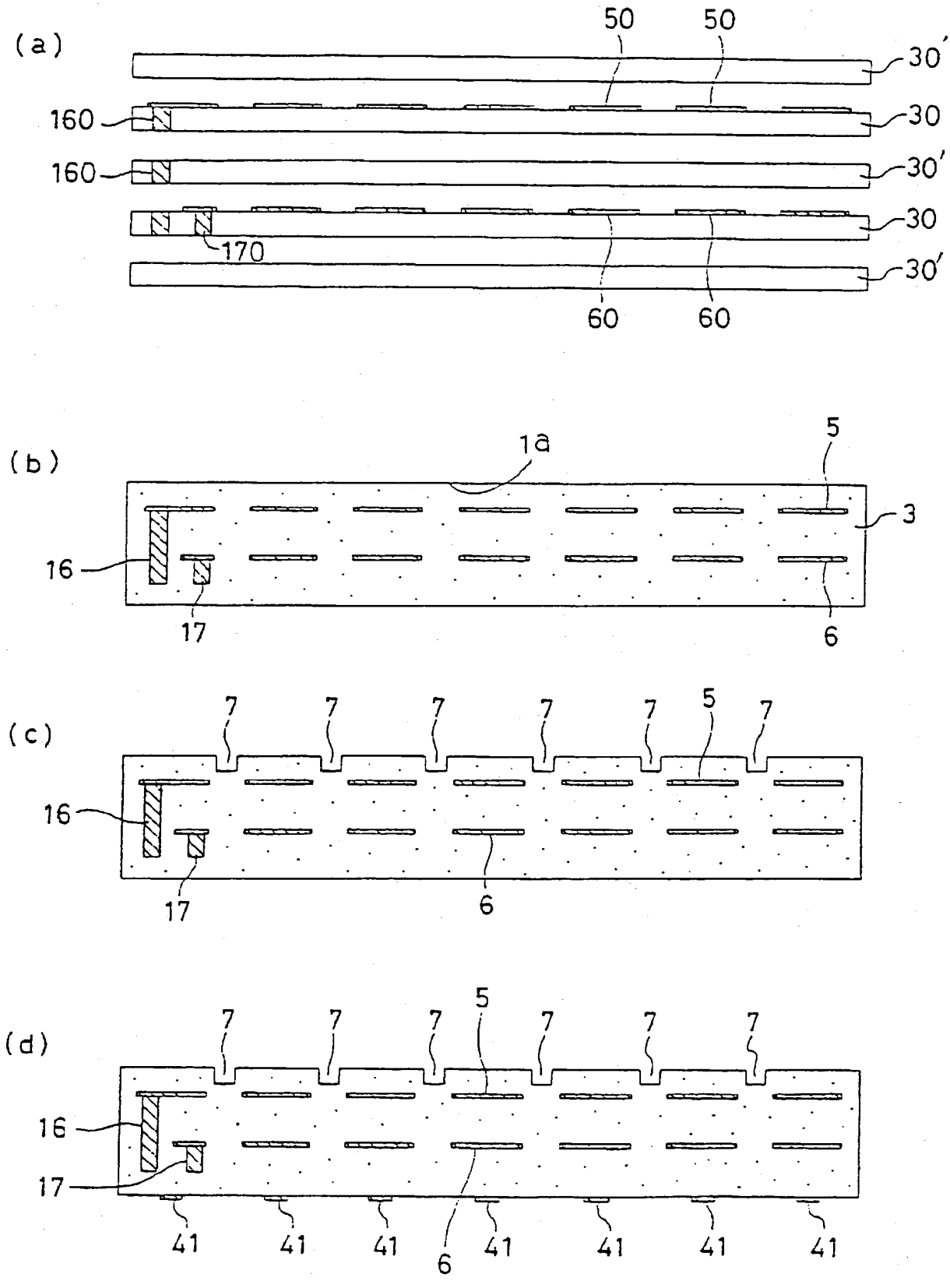

(a)
50
50
30'
160
30
160
30'
30
170
30'
60
60
(b)
1a
5
3
16
17
6
(c)
7
7
7
7
7
5
7
16
17
6
(d)
7
7
7
5
7
7
7
16
17
41
41
41
6
41
41
41
41

Fig. 8

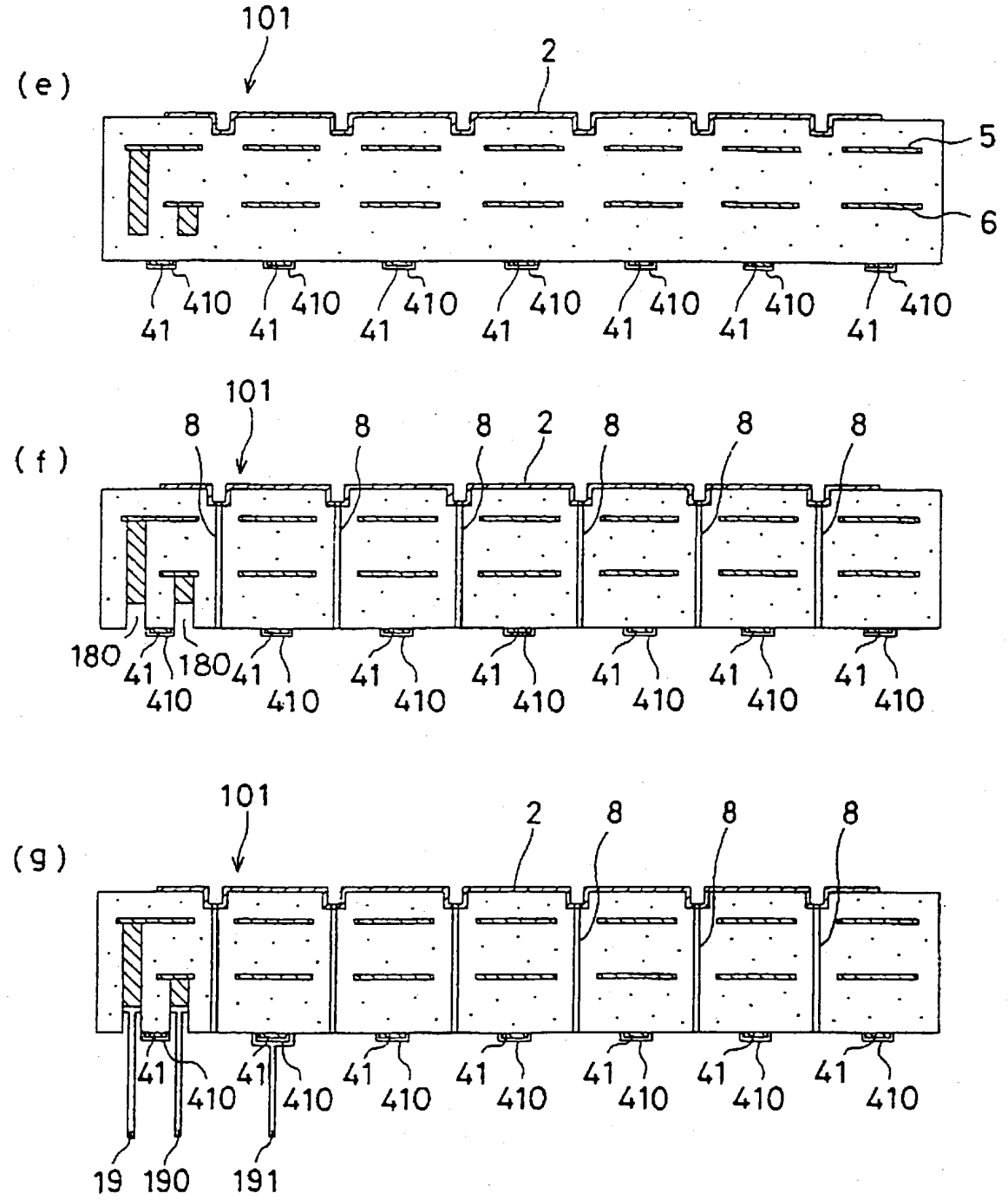


Fig. 9

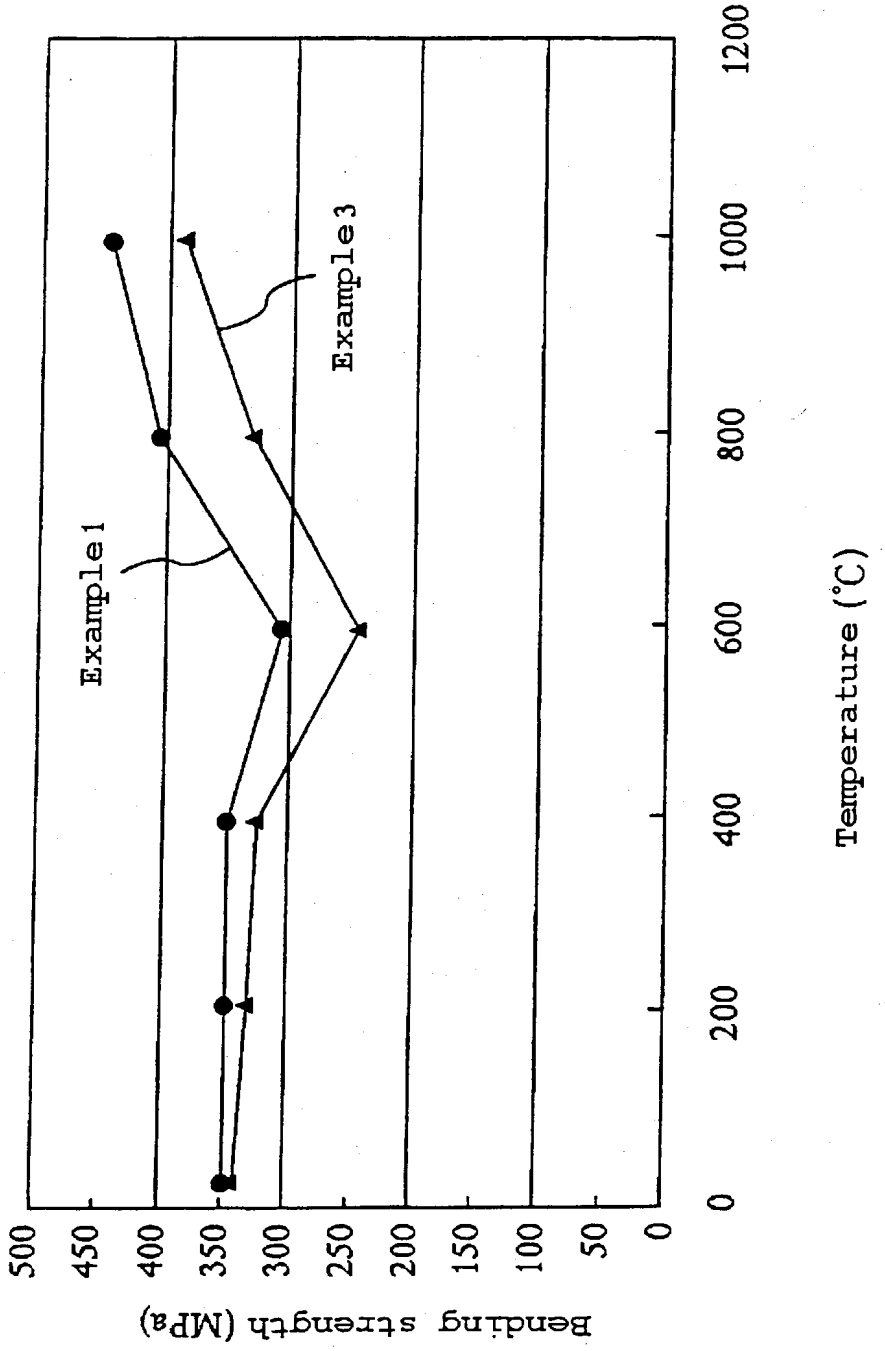

Bending strength (MPa)
500
450
400
350
300
250
200
150
100
50
0
Temperature (°C)
0
200
400
600
800
1000
1200
Example1
Example3

Fig. 10

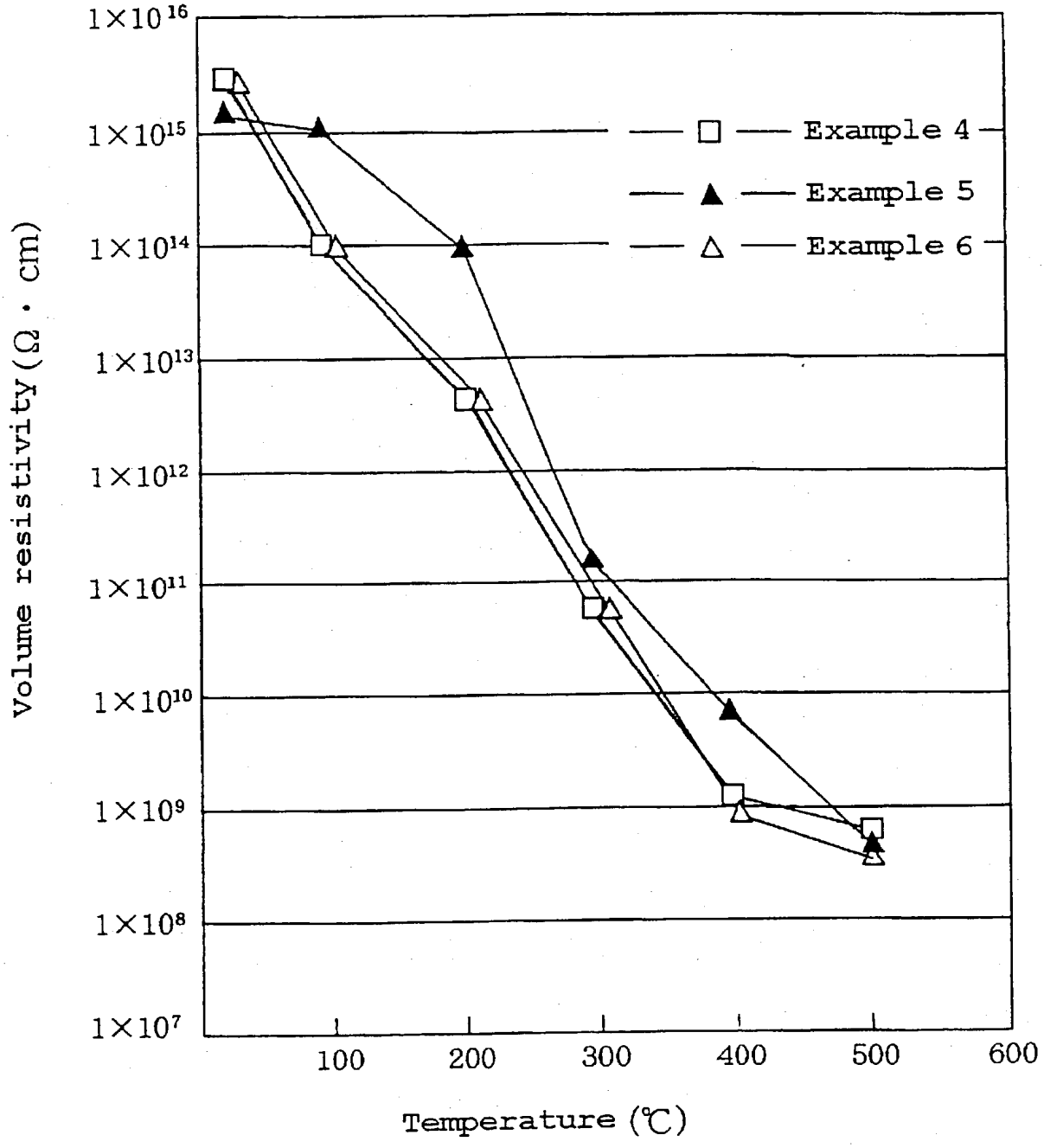

1×10^16
1×10^15
1×10^14
1×10^13
1×10^12
1×10^11
1×10^10
1×10^9
1×10^8
1×10^7
Volume resistivity (Ω・cm)
100
200
300
400
500
600
Temperature (℃)
Example 4
Example 5
Example 6

Fig. 11

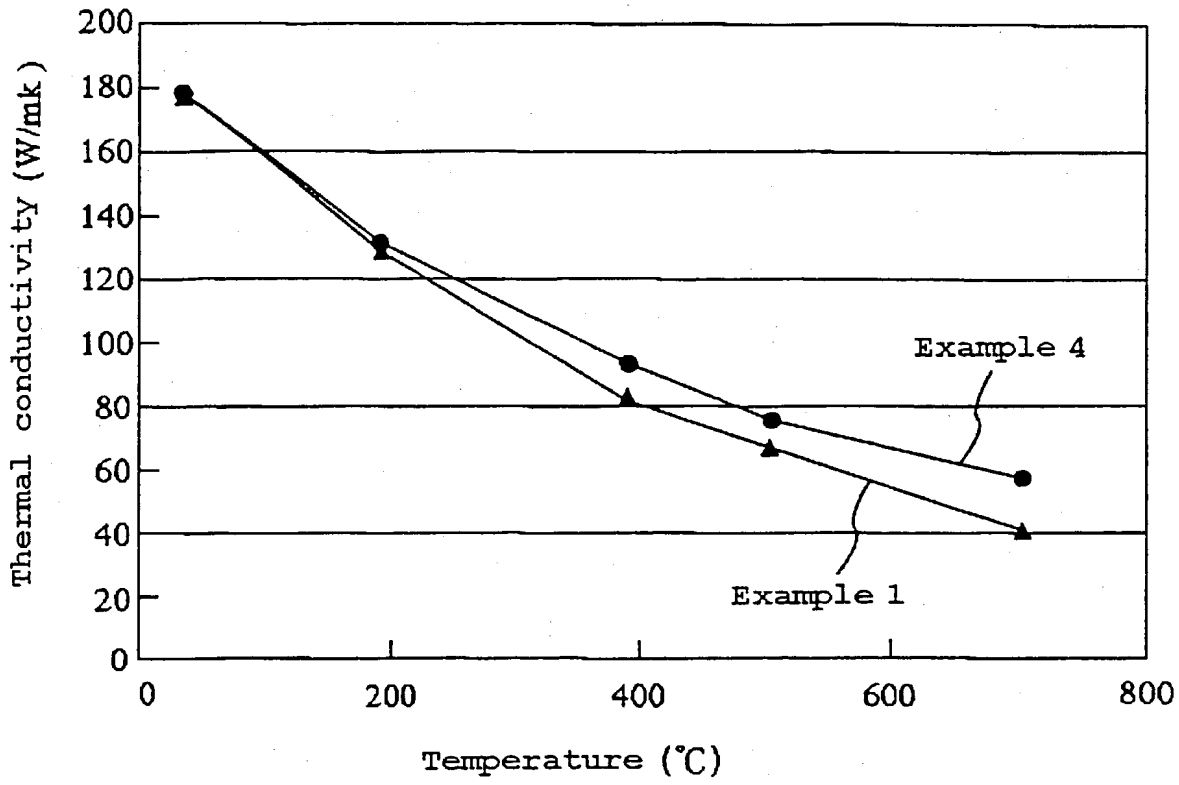

Thermal conductivity (W/mk)
200
180
160
140
120
100
80
60
40
20
0
0
200
400
600
800
Temperature (℃)
Example 4
Example 1

Fig. 12

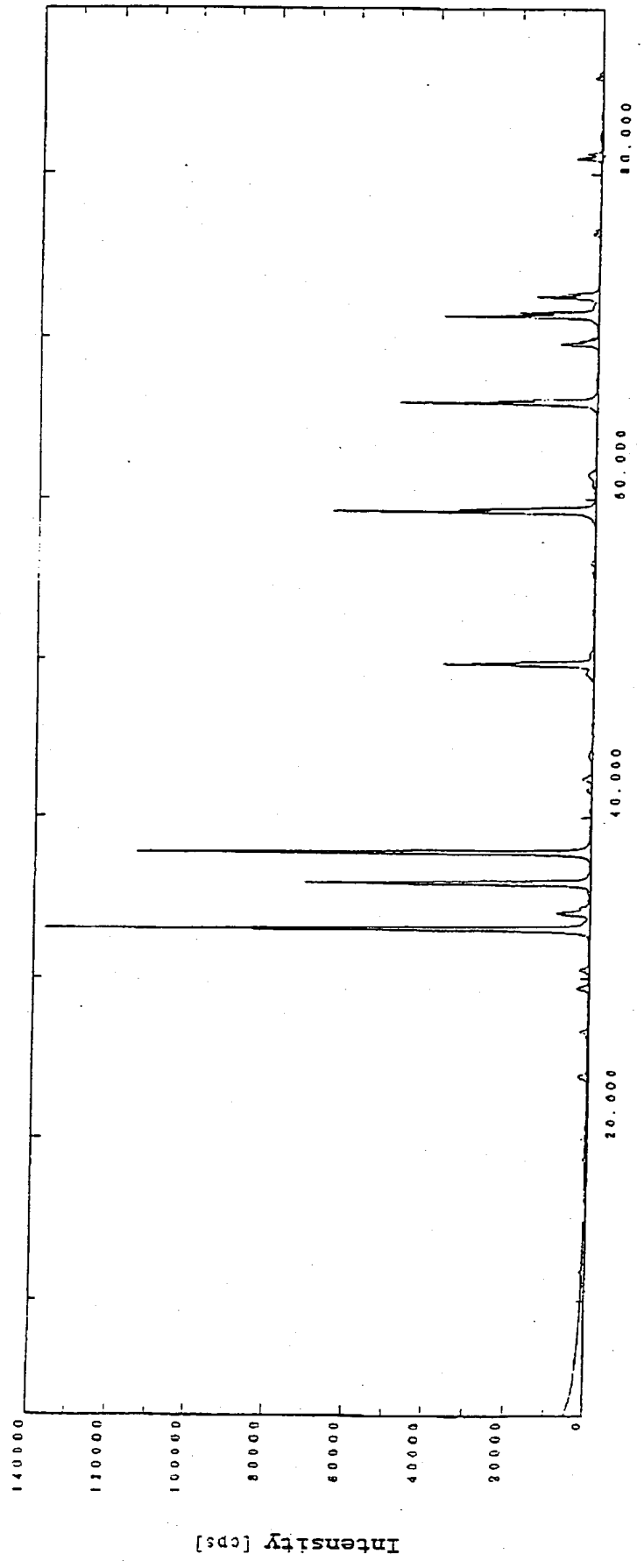

Intensity [cps]
140000
120000
100000
80000
60000
40000
20000
0
20.000
40.000
60.000
80.000
2θ [°]
Sample name : Inside
File : T990603.0340
Comments : Wide angle measurement
Date of measurement : 03-Jun-99 16:50
Measurer : R I N T
X-rays : Cu K-ALPHA1 / 50 kV / 300 mA
Goniometer : RINT 2000 wide angle goniometer
Attachment : Standard sample holder
Filter : Not used
Incident monochrome :
Counter monochrometer : Full automatic monochrometer
Divergent slit : "1deg."
scattering slit : "1deg."
Light-receiving slit : "0.3mm"
Counter: Scintillation counter
Scanning mode: Continuous
Scanning speed: 2000° /min.
Scanning step: 0.020°
Scanning axis: 2θ/θ
Scanning range: 3.000-90.000°
θ offset: 0.000°

Fig. 13

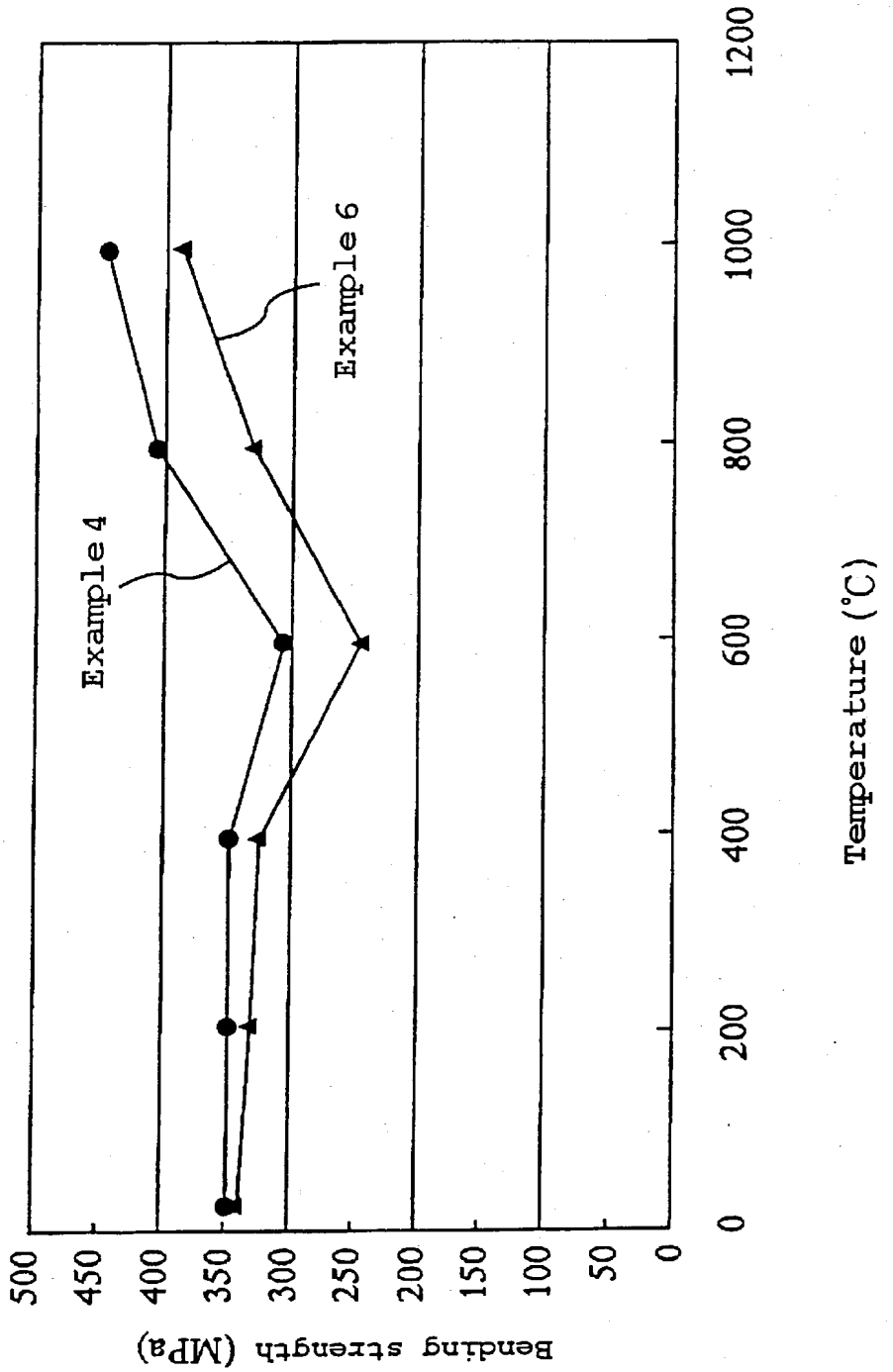

Bending strength (MPa)
500
450
400
350
300
250
200
150
100
50
0
Temperature (°C)
0
200
400
600
800
1000
1200
Example 4
Example 6

Fig. 14

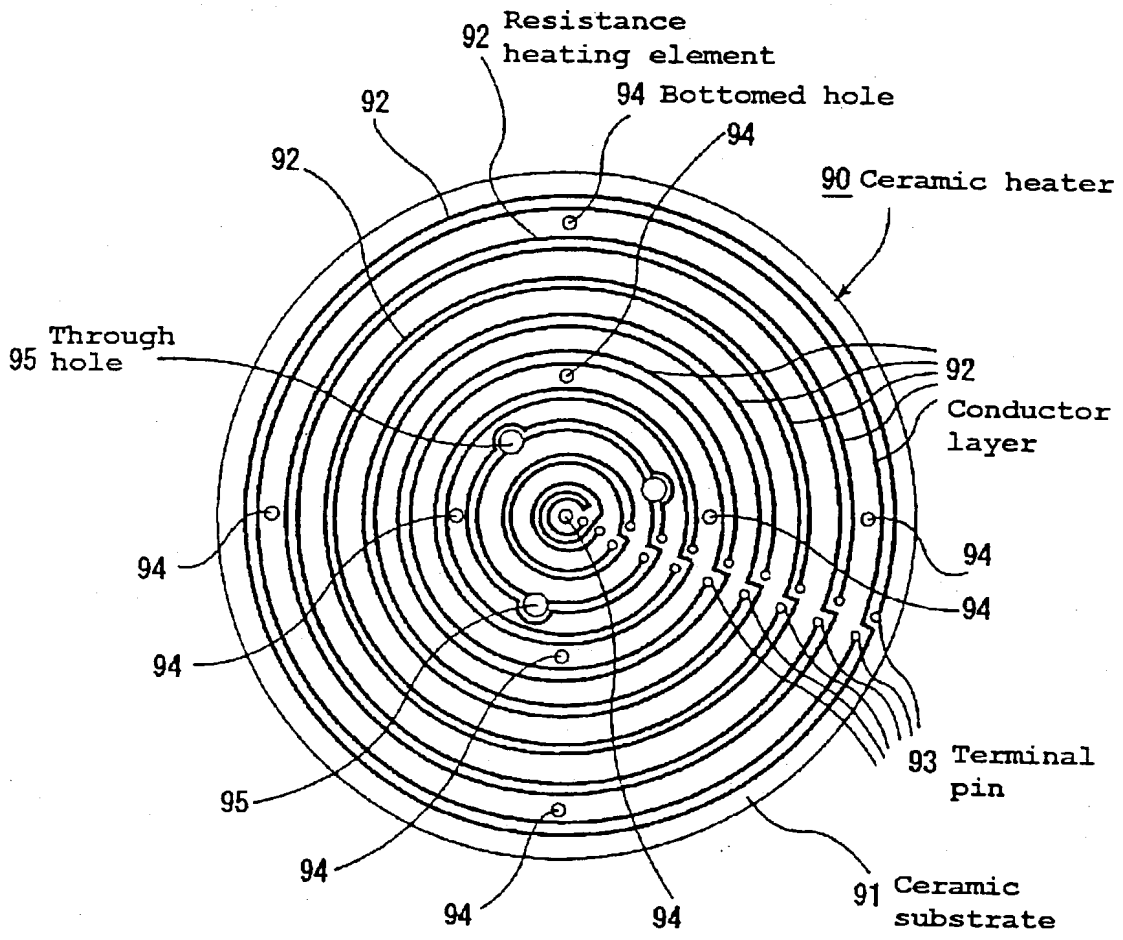

92 Resistance heating element
92
94 Bottomed hole
94
92
90 Ceramic heater
Through 95 hole
92
Conductor layer
94
94
94
94
95
93 Terminal pin
94
94
91 Ceramic substrate

Fig. 15

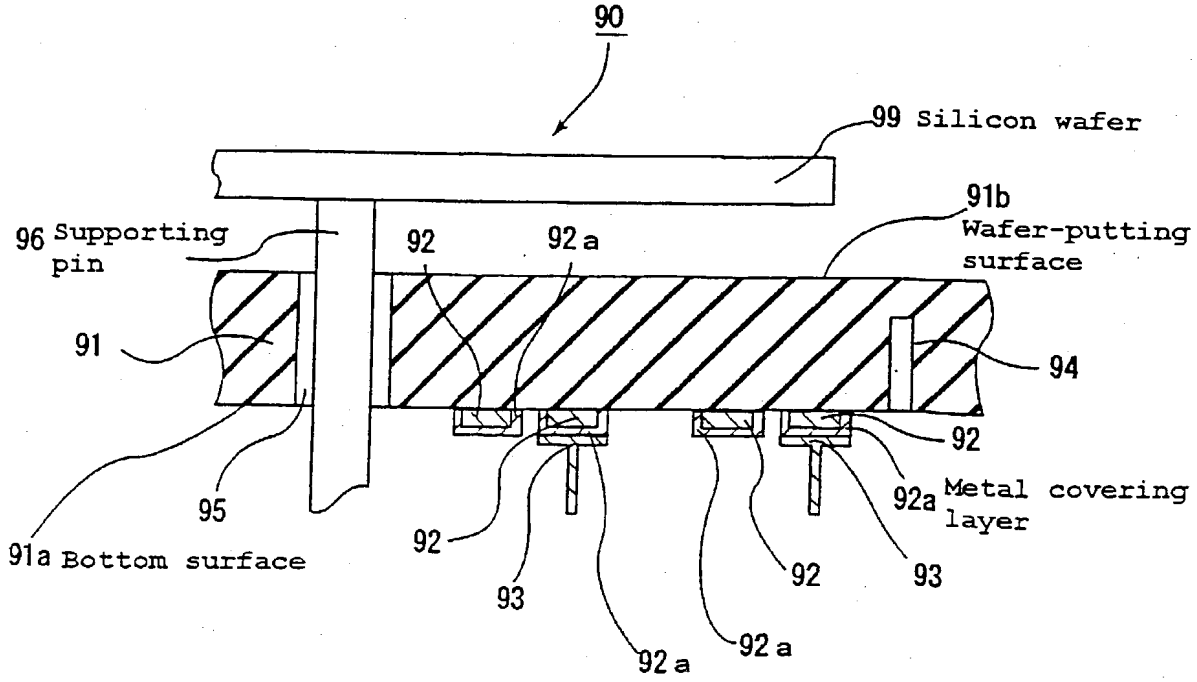

90
99 Silicon wafer
91b Wafer-putting surface
96 Supporting pin
92
92 a
91
94
92
92a Metal covering layer
95
91a Bottom surface
92
93
92
92
93
92 a
92 a

Fig. 16

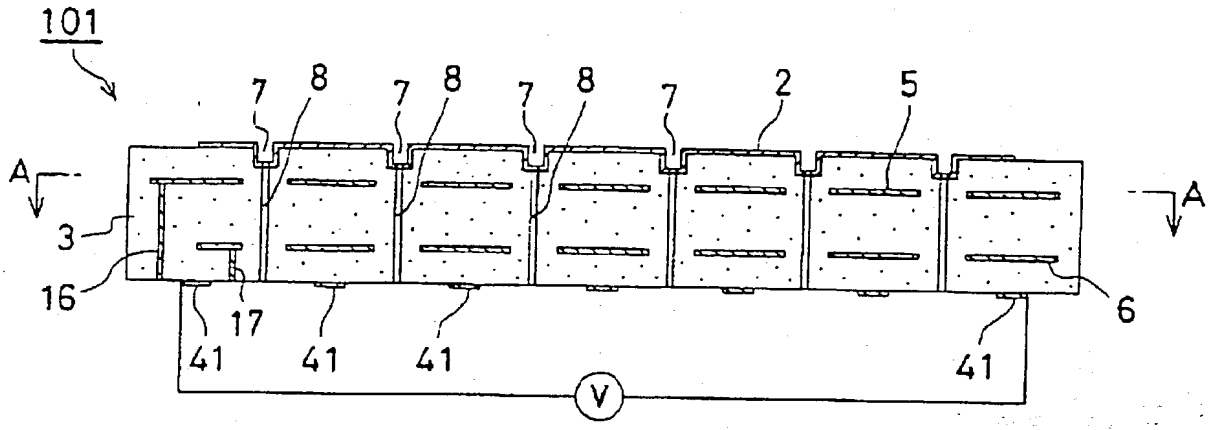


Fig. 17

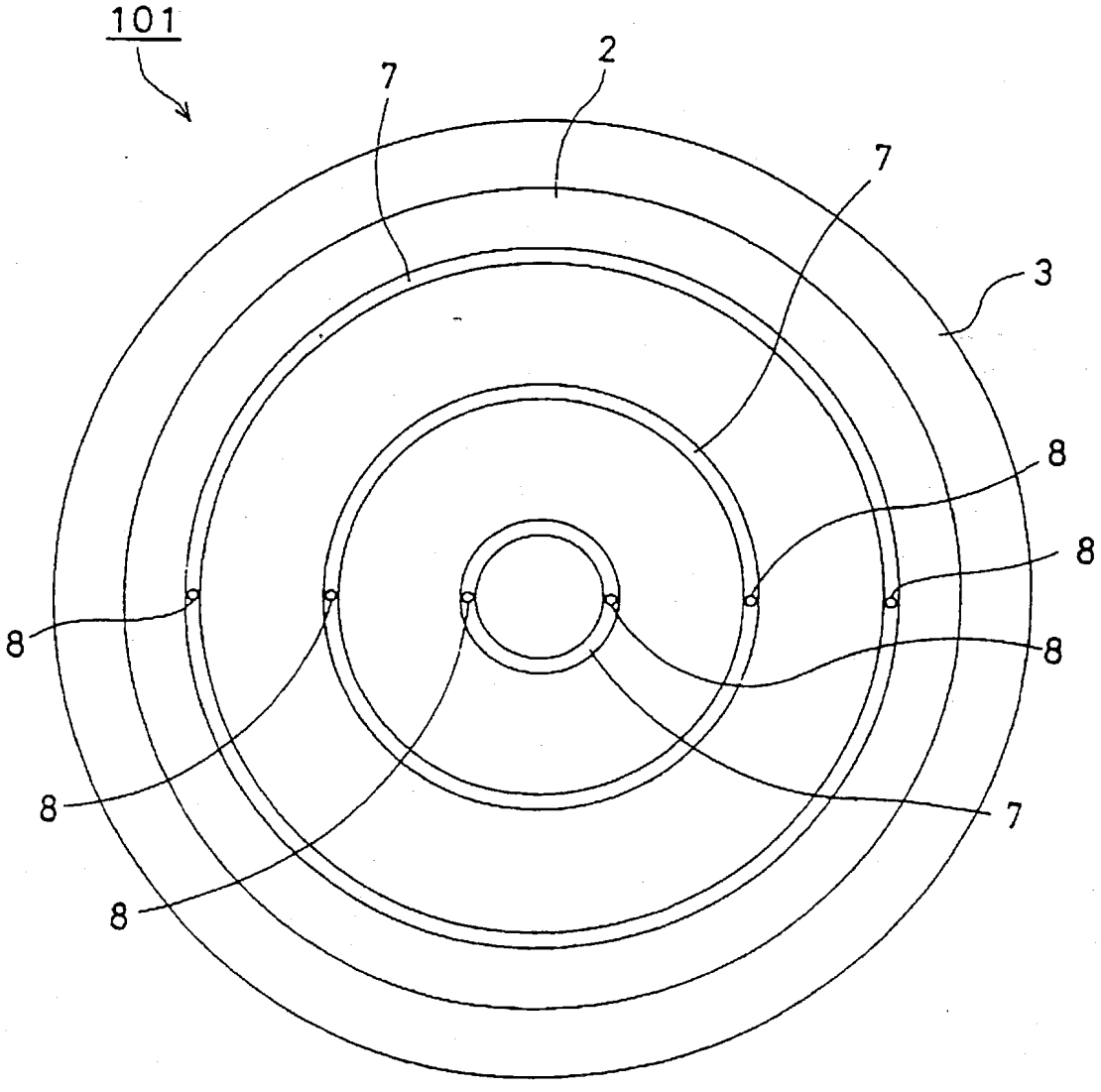
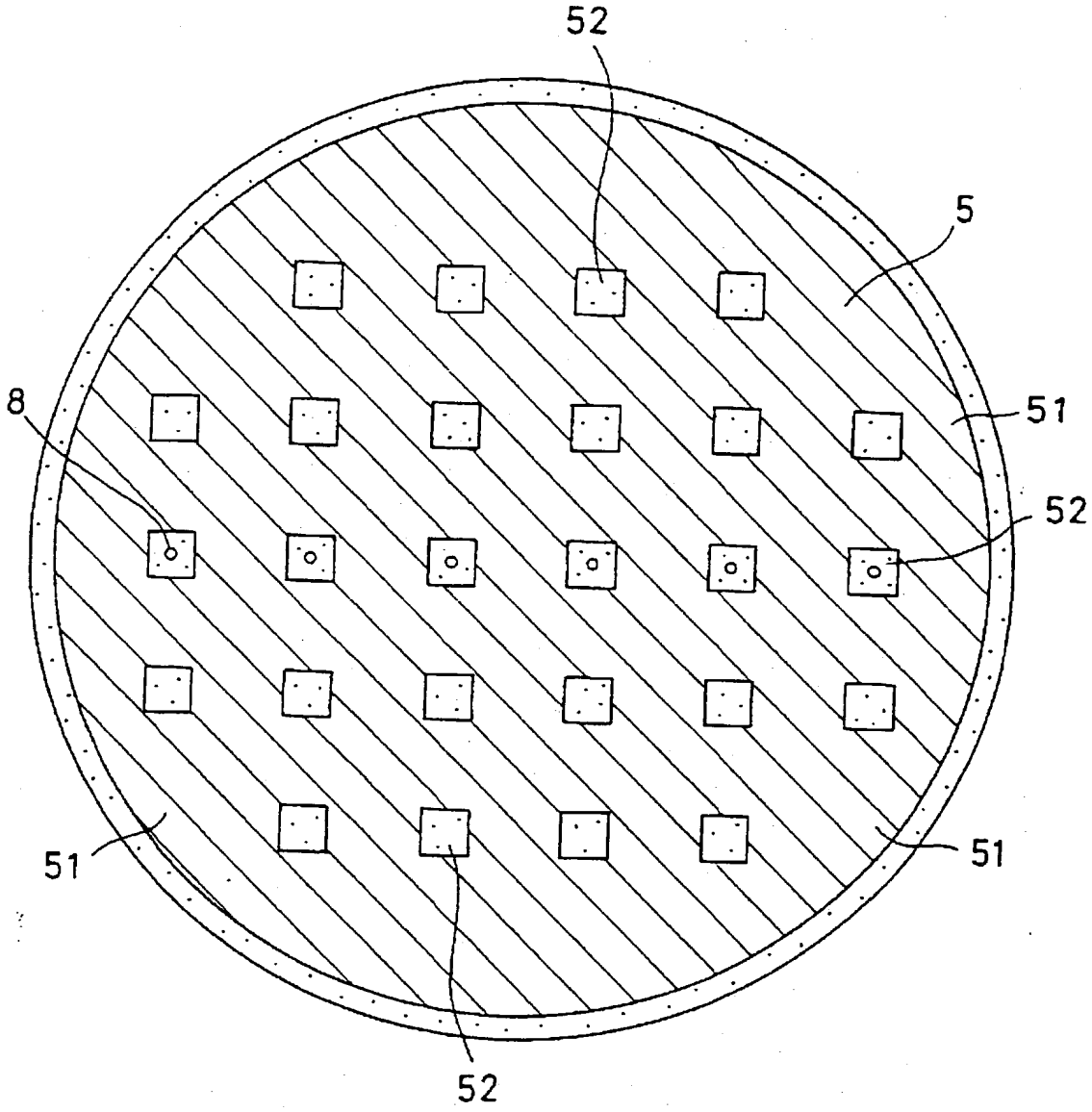



Fig. 18